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Environmental Impact Statement
Volume I

Military Training Use of National Forest Lands
Camp Shelby, Mississippi

July 1994

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6. AUTHOR(S)

Harold E. Balbach, David L. Price, William R. Whitworth, Manroop K. Chawla, and Eric R. Schreiber

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

U.S. Army Construction Engineering Research Laboratories (USACERL)
P.O. Box 9005
Champaign, IL 61826-9005

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Camp Shelby Training Site
ATTN: NGMS-FMO-E
1001 Lee Avenue
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The Department of the Army, National Guard Bureau, proposes to continue Special Permit use of approximately 117,000 acres of National Forest land as an integral part of Camp Shelby, MS. This Environmental Impact Statement (EIS) discusses six alternatives, concentrating on threatened and endangered species, biodiversity, forest fragmentation, soil loss, timber supply, recreation opportunities, and the quality of life for local residents. The conclusion was that no alternative, with one exception, will jeopardize the continued existence of the gopher tortoise; that proposed erosion control measures will be adequate to control the most serious effects of soil movement; that the Forest Service would be able to integrate the proposed timber removal into their existing sales program if this removal were spread over several years; and that the military presence can coexist with civilian recreational use. The Army's preferred alternative will allow both tank gunnery and battalion tracked vehicle maneuvers to take place simultaneously.

This Final EIS was filed with the Environmental Protection Agency in August 1994 and a Record of Decision issued in December 1994 selected an action combining aspects of several alternatives. This document does not represent a pending action, and the public response period expired in October 1994.

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by
Harold E. Balbach
David L. Price
William R. Whitworth
Manroop K. Chawla
Eric R. Schreiber

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This Final EIS was filed with the Environmental Protection Agency in August 1994, and a Record of Decision was issued in December 1994, selected an action combining aspects of several alternatives. The present document does not represent a pending action, and the public response period for this document expired in October 1994.

Foreword

This report was prepared for the Mississippi Army National Guard, the National Guard Bureau, and the Deputy Assistant Secretary of the Army (Environment, Safety, and Occupational Health) with funding through the Mississippi National Guard under military interdepartmental purchase requests NGMS-CF-MIPR-92-10, dated 28 May 92; NGMS-CF-MIPR-92-11, dated 28 August 1992; NGMS-CF-MIPR-93-02, dated 23 February 1993; and ONGMS MOE 94008, dated 11 March 1994, "Preparation of Camp Shelby Final Environmental Impact Statement." The Mississippi National Guard technical monitor was LTC Robert Lee, NGMS-FMO-E.

The work was performed by the Environmental Resources (ENR) team of the Environmental Division (EN), U.S. Army Construction Engineering Research Laboratories (USACERL). The principal investigator was Dr. Harold E. Balbach who is now assigned to the Planning and Mission Impact Division (LL-P) of the Land Management Laboratory (LL). Robert M. Lacey is Acting Chief (LL-P), and Dr. William D. Severinghaus, Operations Chief (LL) and William D. Goran is Chief, CECER-LL.

LTC David J. Rehbein is Commander and Acting Director, USACERL, and Dr. Michael J. O'Connor is Technical Director.

The authors wish to acknowledge the significant contributions made to the Draft EIS by Jo Culbertson and R. Marvin Marlatt of USACERL; the development of Geographic Information System analyses and figures by Bob Lozar, Ed Delisio, and Bob Feeney of USACERL; the preparation of the cultural resources surveys and analyses by Charles Moorehead and Neil Robison of the Mobile, AL, District Office of the Corps of Engineers; and extensive support in reading, revising, and supplementing the Draft and Final EIS by LTC Bob Lee, COL Leland Redmond, COL Woodrow Lyon, LTC G.E. Davis, LTC Lonnie Rayburn, and numerous other officers, enlisted personnel, and civilian employees of the Army National Guard Bureau, Mississippi Army National Guard, and Camp Shelby. John White, formerly of the U.S. Forest Service, provided invaluable assistance in hundreds of instances where National Forest policy, programs, procedures, and plans are discussed. Thomas Craven, of the Mobile District, Corps of Engineers, was also a critical participant in the process from its initiation until his retirement, during the last stages of document finalization. Mike Eubanks assumed this important role for the last months of document assembly, printing, and distribution. In Chapter 7 of the EIS, the names and contributions of many of the scores of participants in the EIS data collection, research, and writing process are described in slightly more detail. Without the assistance of these persons, and others unnamed, successful completion of the project would not have been possible.

LEAD AGENCY: DEPARTMENT OF THE ARMY, U.S. ARMY NATIONAL GUARD BUREAU

COOPERATING AGENCIES: U.S. Forest Service

TITLE OF PROPOSED ACTION: Military Training Use of National Forest Lands at Camp Shelby, Mississippi

AFFECTED JURISDICTION: Mississippi, USA

POINT OF CONTACT: COL Woodrow G. Lyon, Camp Shelby Training Site Commander, Camp Shelby Training Site, 1001 Lee Ave. Camp Shelby, Mississippi, 39407, Tel: (601) 584-2764.

PROPONENTS: Army National Guard Bureau and Mississippi Army National Guard

REVIEWED BY:

KENNETH R. JOHNSON
Forest Supervisor
US Department of Agriculture
Forest Service

REVIEWED BY:

JAMES H. GARNER
Major General, MSARNG
The Adjutant General

REVIEWED BY:

PHILIP W. SPENCE
COL
Director,
Environmental Programs
National Guard Bureau

REVIEWED BY:

JOHN R. D'ARAUJO
Major General, GS
Director,
Army National Guard

APPROVED BY:

LEWIS D. WALKER
Deputy Assistant Secretary
of the Army
(Environment, Safety,
and Occupational. Health),

DOCUMENT DESIGNATION: Final Environmental Impact Statement

ABSTRACT: The Department of the Army, National Guard Bureau, proposes to continue the use of Camp Shelby, Mississippi for military training purposes. This includes approximately 117,000 acres of National Forest land. These lands are currently being used by the Mississippi National Guard as an integral part of Camp Shelby under the terms of a Special Use Permit. This Environmental Impact Statement discusses six alternatives, including no action (no permit is issued), minimal change, and several with changes in training activity. The studies conducted concentrated on possible effects on: threatened and endangered species, biodiversity, forest fragmentation, soil loss, timber supply, recreation opportunities, and the quality of life for local residents. The studies concluded: that implementation of any alternative, with the exception of 3B will result in a non-jeopardy opinion from the U.S. Fish and Wildlife Service (will not jeopardize the continued existence of the gopher tortoise); that proposed erosion control measures will be adequate to control the most serious effects of soil movement; that the Forest Service would be able to integrate the proposed timber removal into their existing sales program if this removal were spread over several years; and that the military presence can coexist with civilian recreational use. The Army's preferred alternative will allow enough area so that both tank gunnery and battalion tracked vehicle maneuver can take place at the same time. A plan is being considered which combines aspects of more than one alternative. This will allow the agencies to balance environmental impacts with achieving the Army's training needs.

PREFACE

This Environmental Impact Statement differs from the typical EIS in that four different "actions" are being examined in one document. First, the environmental consequences of the present, ongoing military training activities at Camp Shelby are examined. Second, several new facilities which are required for the efficient conduct of training and operation of the installation are proposed for construction, and their environmental effects are studied in the context of the present usage of the installation. Third, it is proposed that several changes be made in the manner in which Camp Shelby provides training opportunity to the many armor and mechanized units which it serves. These changes are the result of changes in Army policy and doctrine in recent years, and are similar to the needs of other Army installations which have similar missions.

Finally, the cumulative effects of all National Guard military activities, past, present and proposed, are evaluated in the context of implementation of new land management capabilities and programs. The EIS will be used by both the Army and the U.S. Forest Service to assist in making decisions related to future use of Camp Shelby.

This multi-faceted coverage means that similar problems and questions may be mentioned in three or more different locations in the document, depending on their context. To assist the reader of the EIS, we provide the following "road map" to its coverage and contents:

Chapter 1 - National Guard activities, current and proposed; includes background, needs, and goals; defines and describes the Alternatives.

Chapter 2 - Describes the present environment, its status, and sensitivities; outlines present usage of all parts of the installation.

Chapter 3 - Discusses environmental impacts of present and proposed actions, and those present and proposed practices designed to avoid and remediate those problems which have or could arise. Its major divisions are:

- Section 3.1 - Effects of present military activities
- Section 3.2 - Mitigation procedures currently in use
- Section 3.3 - Predicted effects of proposed actions and alternatives
- Section 3.4 - Mitigation and avoidance procedures proposed to be implemented in the future
- Section 3.5 - Examination of cumulative impacts

Chapter 4 - Summary, conclusions and recommendations

The several appendices present background documents, reports, and data which were used in developing the EIS and can be found in Volume 2. The final volume (Volume 3 "Response to Comments") gives a response to issues raised by the public.

SUMMARY

BACKGROUND

Camp Shelby, Mississippi is the largest National Guard Training installation in the United States. Camp Shelby is comprised of about 134,000 acres of land. Land ownership is divided among the State of Mississippi (8,200 acres), the Department of Army (7,300 acres) and the United States Forest Service (Forest Service) (117,000 acres). Camp Shelby lies in southeastern Mississippi and covers portions of Forrest, George, and Perry Counties (Figure 1).

The Camp was first used for military training during World War I when troop populations were higher than present. The Army has used Camp Shelby as a military training location on a regular basis, with great variation in level of use, since the 1940's. Training activities at Camp Shelby take place in either the cantonment (built-up area) or the operational (field training and range) area. The most common types of unit training at Camp Shelby include combat maneuver units (armor, mechanized infantry, artillery, and engineers) and combat service support units (supply, medical, aviation, maintenance). In addition, the Mississippi Air National Guard operates an air-to-ground gunnery range.

For purposes of this Final Environmental Impact Statement (EIS), the term "Army" means the United States Department of the Army and includes the National Guard Bureau and Mississippi National Guard. For this EIS the Army is the lead federal agency and the Forest Service is a cooperating federal agency.

WHAT IS COVERED IN THIS DOCUMENT

This EIS evaluates five principal issues, all related to the use of Forest Service lands for military training at Camp Shelby by the Mississippi National Guard. The five issues are as follows:

Issue 1: What are the environmental effects of carrying out the present type and level of training?

Issue 2: What are the effects of building, operating, and maintaining several firing ranges and other related training facilities?

Issue 3: What are the effects of developing new tracked vehicle maneuver areas? Several alternatives are analyzed.

Issue 4: What would be the cumulative effects on the environment of all past, present, and anticipated future actions when combined?

Issue 5: What actions can be taken to mitigate potential effects on the environment?

WHY IS THIS STUDY NECESSARY

The EIS process, required by the National Environmental Policy Act (NEPA), specifies that a federal agency develop an environmental impact statement for major activities that have the potential to significantly affect the human environment and to coordinate this analysis with the appropriate agencies and the public. The public review process is used by the lead agency to scope (identify) the significant issues and to help develop/evaluate alternatives, and ultimately to choose an alternative in a Record of Decision (ROD).

Almost all of the training land now used at Camp Shelby is administered by the Forest Service, and present training is allowed through a Special Use Permit (SUP) which has been extended by the Forest Service to the Mississippi National Guard. Under both Forest Service and Army regulations, the renewal of the permit must be based on the preparation of an environmental analysis which looks at all important environmental issues involved.

Two federal agencies will use this EIS in their decisions concerning Camp Shelby, Mississippi. The Forest Service will decide the terms and conditions of a new Special Use Permit based upon the findings of this EIS. The Special Use Permit will describe the location and nature of military training activities to be permitted on National Forest Lands. The Department of the Army will utilize this EIS to verify in their Record of Decision (ROD) their selected alternative and commitment of manpower and resources to support operations and training activities at Camp Shelby, Mississippi within the framework of the Special Use Permit.

WHY DOES THE NATIONAL GUARD NEED TO DO THIS

The National Guard and Reserve Components are being required to shoulder more of the defense burden and to achieve levels of mobilization readiness unprecedented in the history of this country. In addition, heavier and faster vehicles, longer combat engagement distances, increases in mechanization, and enhanced combat readiness through combined arms exercises have effectively increased the requirement for training land at Camp Shelby suitable for this type of training. At the same time, the Army's basic fighting doctrine, AirLand Battle, makes essential the use of effective combined arms teams. Training in the development of such teams by brigade, battalion and company size units is needed to ensure combat readiness.

DECISION MAKING PROCESS

Identification of a Preferred Alternative

The "preferred" alternative is a regulatory term declaring an agency's ideal alternative which best meets their needs and objectives. The Army identified its preferred alternative in the Draft EIS in accordance with 40 Code of Federal Regulations 1502.14(e) and Army Regulation 200-2. The preferred alternative should *not* be confused with the ultimate decision to be published by the Army in the Record of Decision, approximately 30 days following publication of this Final EIS. That decision will balance the needs and objectives of the

Army's training requirements with factors such as: results of the public review process; identification of environmental impacts and mitigation actions; financial considerations; and the framework and constraints of a Forest Service Special Use Permit.

The Army's preferred alternative is Alternative 1, which best meets the present readiness requirements of the National Guard units for which Camp Shelby is the station for training and mobilization. Alternatives 2, 3A, 3B, and 4 would provide about the same levels of readiness as at present. Alternative 5 would give units from the Mississippi area only one part of their readiness requirement, gunnery marksmanship. The Army believes that Alternative 6 (the no action alternative, i.e., no Special Use Permit will be issued and both maneuver training and firing range usage will cease), will significantly harm national military readiness as well as the state emergency mission provided by the installation.

Record of Decision

The Army and Forest Service will each issue separate Records of Decision following the prescribed waiting period after publication of the Final EIS. The Army and Forest Service have been involved in discussions throughout the EIS process. In accordance with Army and Forest Service regulations, the Records of Decision may select any of the alternatives examined in the Final EIS or be comprised of components of several different alternatives, so long as the recommended plan is within the range of environmental impacts discussed in the Final EIS.

Based upon the comments received on the Draft EIS and other considerations, Army and Forest Service discussions indicate that a possible compromise decision is being considered (with components of alternatives presented in the EIS). A combination alternative plan would allow the agencies to balance environmental impacts with achieving much of the Army's training needs. The combination alternative that is being considered includes the following features:

1. Addresses the concerns regarding tracked vehicle training use in the Leaf River Wildlife Management Area.

2. Addresses public and agency environmental concerns, especially those that relate to the gopher tortoise.

3. Provides for simultaneous maneuver training and range operation.

SUMMARY OF ALTERNATIVES AND IMPACTS

There are six basic alternatives, including one with two variations, to continue and improve military training use of National Forest lands in the De Soto National Forest. These alternatives and the new facilities and improvements that go along with each alternative are summarized as follows:

Alternative 1 proposes to continue military training, and develop training areas suitable for battalion task force maneuvers under the AirLand Battle concept (Figure 2).

This alternative would result in the most far-reaching, short-term, environmental modifications. It would thus require the greatest effort to manage the planning and construction process so heavy environmental damage would not take place. If this alternative is selected, Camp Shelby and the Army National Guard is committed to securing resources for mitigation, maintenance, and repair measures. Alternative 1 also would provide by far the best training areas for use in battalion level maneuver for AirLand Battle training. Thus, it would meet Camp Shelby's tracked vehicle training mission requirements best. Maneuver and tank gunnery can take place at the same time. The U.S. Fish and Wildlife Service biological opinion on the gopher tortoise finds that this alternative will not harm the survival of the tortoise. Noise effects and quality of life for area residents would show no net change, although some activity would be moved to the southeast part of the permit area.

Alternative 2 proposes to continue military training and develop training areas suitable for use by company teams, a smaller unit size than a battalion, under the AirLand Battle concept (Figure 3).

This alternative would result, in the short term, in environmental modifications almost as far-reaching as for Alternative 1. Thus, it would require almost the same effort to manage the planning and construction process so heavy environmental damage would not take place. If this alternative is selected, Camp Shelby and the Army National Guard is committed to securing resources for mitigation, maintenance, and repair measures. Alternative 2 would provide improved training areas for use in company team level maneuvers for AirLand Battle training. It would meet Camp Shelby's mission requirements better than at present. Vehicle maneuver and tank gunnery training exercises could take place at the same time. The U.S. Fish and Wildlife Service biological opinion on the gopher tortoise finds that this alternative would not harm the survival of the tortoise. Noise effects and quality of life for area residents would show no net change, although some activity would be moved to the southeast part of the permit area.

Alternative 3A proposes to continue military training and develop training areas smaller in size than those now in use, but outside the tank main gun safety closure area, so maneuver training may take place at the same time as tank gunnery (Figure 4). Many needs of AirLand Battle training can be met, although less than ideally. All proposed training areas are north and west of Forest Service Road 303 (Eight Mile Road).

This alternative would result, in the short term, in less forest clearing than required for Alternatives 1 and 2. There also would be less effort in managing the planning and construction processes so environmental damage would not take place. If this alternative is selected, Camp Shelby and the Army National Guard is committed to securing resources for mitigation, maintenance, and repair measures. Less mitigation would be required for this alternative. This alternative would provide a better training situation for use in company team level maneuver training. It would thus meet Camp Shelby's mission needs better than at

present. Vehicle maneuver and tank gunnery training exercises can take place at the same time. The U.S. Fish and Wildlife Service biological opinion on the gopher tortoise finds that this alternative will not harm the survival of the tortoise. Noise effects and quality of life for area residents would show no net change, although some activity would be moved to the north and central part of the permit area.

Alternative 3B proposes to continue military training, and develop training areas similar in size to those now in use. But all areas added over Alternative 3A are inside the tank main gun safety closure area, and no maneuver training may take place on these areas at the same time as tank gunnery (Figure 5). Many needs of AirLand Battle training can be met, although less than ideally. Similar to Alternative 3A, all proposed training areas are north and west of Forest Service Road 303 (Eight Mile Road).

This alternative would result, in the short term, in almost as much environmental modification as would be required for Alternatives 1 and 2, but in a very sensitive environmental setting. The U.S. Fish and Wildlife Service biological opinion on the gopher tortoise finds that this alternative may jeopardize the continued existence of the gopher tortoise.

Alternative 4 proposes to continue military training (platoon and company level), using the same areas for maneuver training as at present (Figure 6). Many of these maneuver areas are relatively small and do not connect with each other. This makes them inadequate for AirLand Battle training. Many areas are inside the tank main gun safety closure area and cannot be used at the same time with tank gunnery practice.

This alternative would require the fewest environmental changes and the smallest planning and implementation effort on the part of the National Guard and the Army. Application of land protection practices similar to those proposed for the other alternatives will mean that future uses will result in less environmental degradation than at present, even though the same areas are being used. The training capability would not be improved, and conduct of unit maneuvers utilizing the AirLand Battle concept would continue to be less than adequate. The U.S. Fish and Wildlife Service biological opinion on the gopher tortoise finds this alternative as not harming the survival of the tortoise. Noise effects and quality of life for area residents would show no change from present.

Alternative 5 proposes to eliminate tracked vehicle maneuver training, while keeping gunnery and other non-maneuver training. Few of the needs of AirLand Battle training can be met.

This alternative would require no environmental changes for maneuver areas. The U.S. Fish and Wildlife Service biological opinion on the gopher tortoise considers this alternative as not harming the survival of the tortoise. The maneuver areas returned to forest management should be very similar to normal reforestation areas. Noise effects due to weapons and aircraft and the quality of life for area residents would show no change, except armored vehicle convoys would no longer be crossing or require use of public roads in the area.

Alternative 6 would issue no Special Use Permit for any military training use of National Forest lands. Camp Shelby would cease training activities, and all military readiness activities now carried out at Camp Shelby would be eliminated or moved to other locations.

This alternative would require no environmental changes for maneuver areas or facilities projects. The U.S. Fish and Wildlife Service biological opinion on the gopher tortoise considers this alternative as not harming the survival of the tortoise. The maneuver areas returned to forest management should be very similar to normal reforestation areas. Neither weapons nor military aircraft would be used in the area, and therefore would no longer impact the quality of life. Locally, significant decreases in economic activity associated with military training activities would be expected. The no action alternative, where no Special Use Permit is issued, will have locally severe, negative social and economic effects. Outdoor recreation would benefit by elimination of military restrictions to the area.

Table S-1 shows the size of the study area for each alternative. It also shows the acreage of the areas proposed to be cleared or thinned, and acreage on which no changes are needed. Also shown is that area within each proposed tracked training area that is now under National Forest management, the area owned by the Department of Defense (DOD), and the area now used as tracked maneuver area. Table S-2 shows which of the six facilities projects are associated with each alternative. Figures S-1 through S-6 show the general location of Camp Shelby and the relative location of lands proposed for the various action alternatives.

Table S-1 Maneuver Area Alternatives Proposed (acres)

	Alternative						
Acreage Affected	**1**	**2**	**3A**	**3B**	**4**	**5**	**6**
Total Training Area Available	35,512	31,824	11,601	21,883	17,561	0	0
Total Area Available For Tracked Vehicle Maneuver	17,459	15,995	5,820	9,036	11,087	0	0
Acres Proposed for Thinning	5,916	6,262	2,724	5,995	9,429	0	0
Acres Proposed for Clearing	14,939	12,738	4,517	5,273	6,398	0	0
Acres Now Used for Tracked Vehicle Training within the Area Available for tracked vehicle maneuver	5,359	2,949	4,370	6,296	11,087	0	0
Acres within the area available for tracked vehicle maneuver which are outside the Range Safety Closure Area	17,459	15,995	5,820	5,820	7,192	0	0

The "Total Training Area Available" is shown in Figures S-2 through S-6.

Table S-2 Construction Projects Proposed

	Alternative						
Project	**1**	**2**	**3A**	**3B**	**4**	**5**	**6**
Automated Tank Table VIII	✓	✓	✓	✓	✓	✓	
Multi-Purpose Range Complex (Heavy)	✓	✓	✓	✓		✓	
Automated Tank Wash	✓	✓	✓	✓	✓	✓	
Explosive Ordnance Disposal Facility	✓	✓	✓	✓	✓	✓	
CALFEX Assembly Areas	✓	✓	✓	✓	✓	✓	
Tactical Aviation Areas	✓	✓	✓	✓			

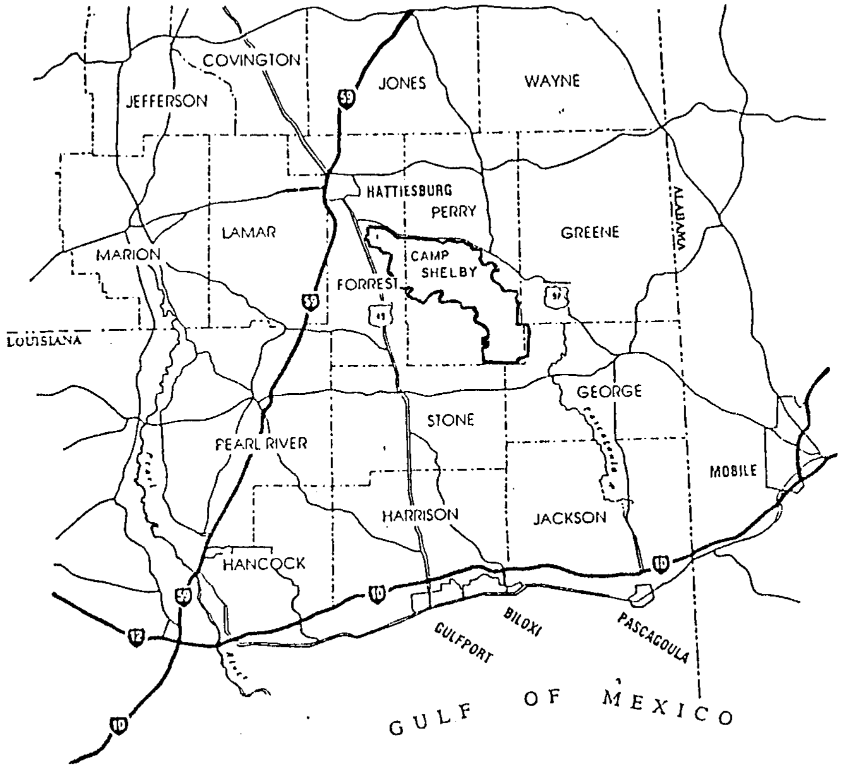

Figure S-1. Camp Shelby, Mississippi Location Map

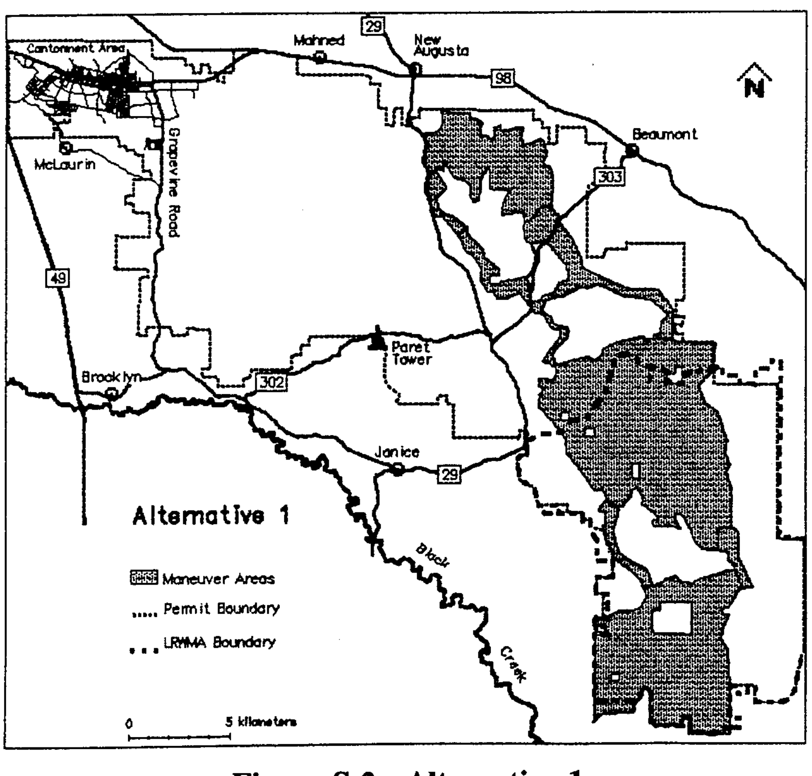

Figure S-2. Alternative 1

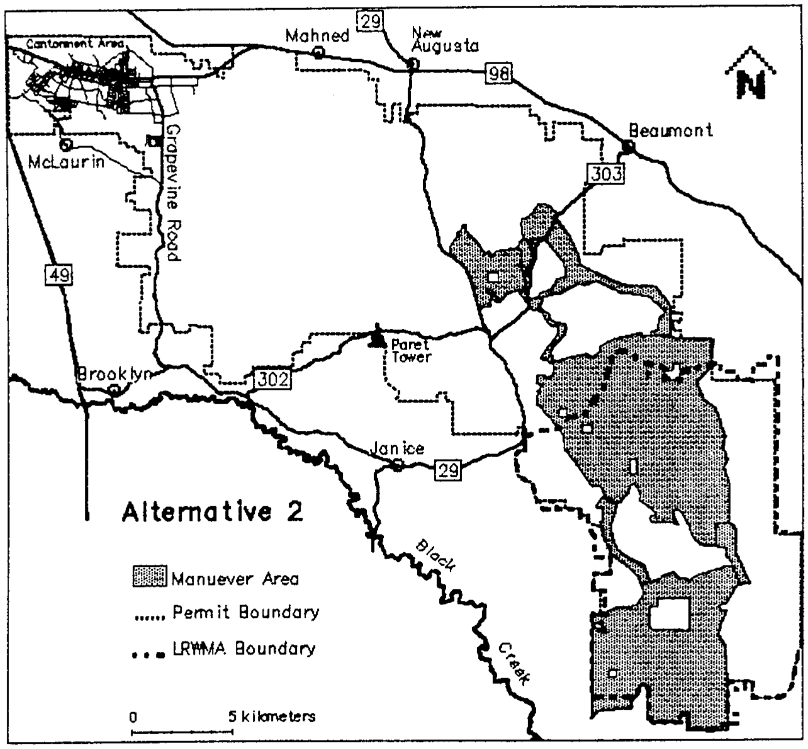

Figure S-3. Alternative 2

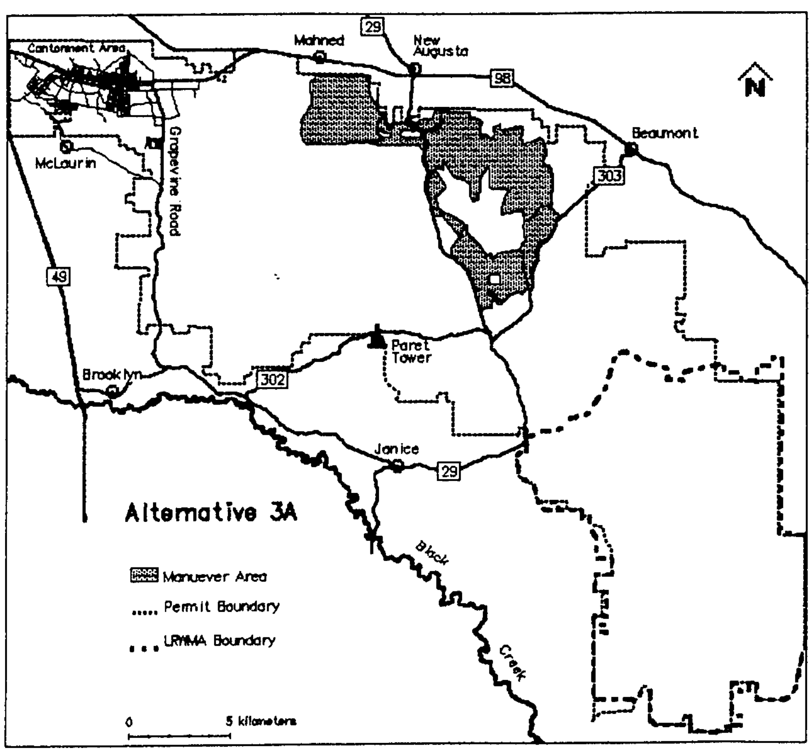

Figure S-4. Alternative 3a

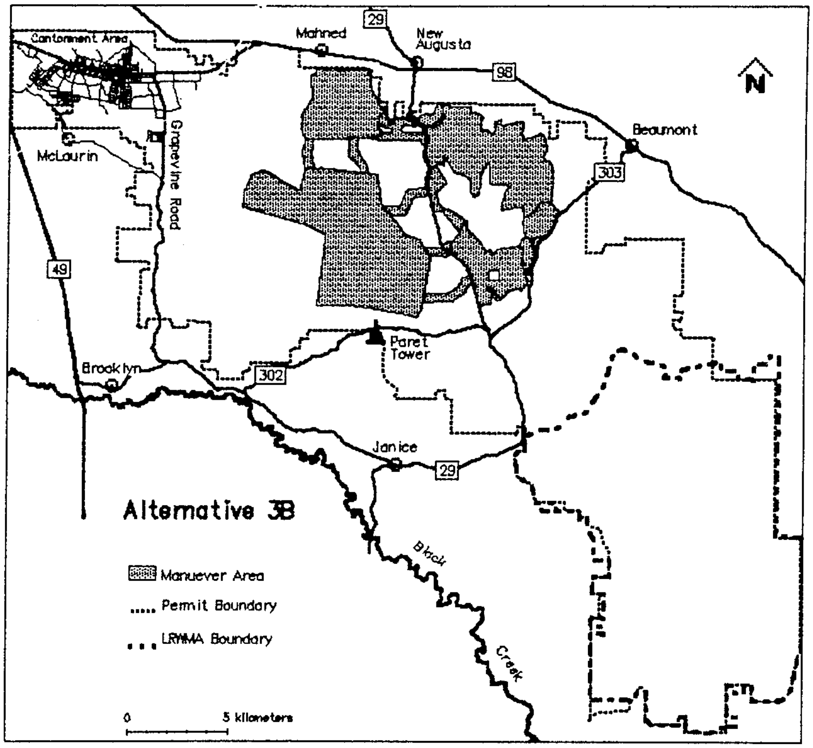

Figure S-5. Alternative 3b

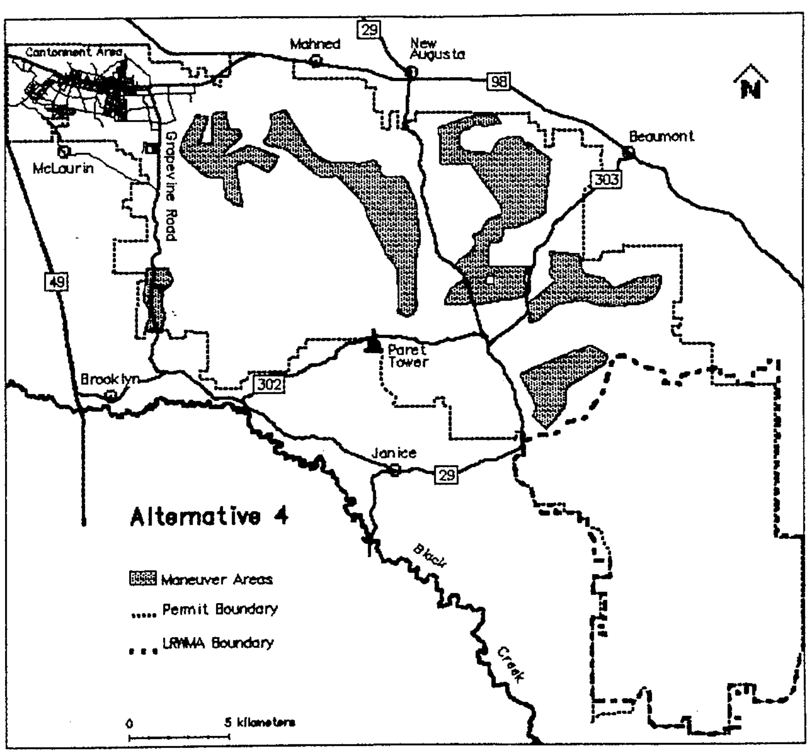

Figure S-6. Alternative 4

SUMMARY OF ENVIRONMENTAL CONSEQUENCES AND PROPOSED MITIGATION

Management of the environment at Camp Shelby is achieved by implementation of mitigation and monitoring plans. Mitigation includes the following five types of actions: a) avoiding the impact altogether by not taking a certain action or parts of an action; b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of an action; and e) compensating for the impact by replacing or providing substitute resources or environments.

The Army plan for mitigation as it relates to use of training areas is the Integrated Training Area Management Plan (ITAM). The plan includes mitigation measures for wildlife, threatened, endangered and sensitive species, soils, watershed, erosion control, wetlands, and vegetation. This plan will monitor use of land for training, determine the potential and actual impacts and prescribe mitigation actions. Decisions concerning scheduling of training areas, type of training, budget for recovery and other related management areas will be supported by ITAM. In addition to ITAM the following areas have been included in mitigation planning: water quality monitoring, noise monitoring, biodiversity, and timber management.

Camp Shelby and the Army National Guard have chosen to fully carry out the Integrated Training Area Management (ITAM) program, which should be fully able to manage all these effects when fully implemented. The Army National Guard Bureau is committed to securing resources for the alternative chosen, including the costs of mitigation.

Summary of Impacts by Environmental Topic

Here is a summary of the environmental effects reasonably expected if each alternative were to be carried out, and recommended mitigation procedures were in place. This relates to the original scoping issues for this EIS. Here, the environmental results of each of the six alternatives also have been shown in both short- and long-term effects (Tables S-3 and S-4). In this table, all parts of all subprojects within or under an alternative are combined into an overall score. The basis for scoring is the expected *change from present conditions and effects*. A score of zero thus means that no major difference is seen between the conditions after the action and those now in effect. It does not mean that there are no effects at all.

Regional Economy/Employment - The regional economy/employment will not be affected by Alternatives 1 through 4, long or short term. However, Alternatives 5 and 6 will have a negative effect, both long and short term, with Alternative 6 having the greater negative effect.

Outdoor Recreation - In the short term, hunting opportunity and access will be improved slightly by Alternatives 1 and 2, and unchanged in Alternatives 3A, 3B, 4, and 5. In the short term, Alternative 6 should be slightly beneficial due to the elimination of military restrictions

on access to the area. Depending on alternative, long-term effects of all alternatives are anticipated to have similar ratings to the short term.

Quality of Life - Alternatives 1 through 5 propose the same level of artillery, tank gunnery, and tactical aviation training, and with no more weapons or crews than at present. Therefore, Alternative 6 would have the only positive effect on noise either short or long term. Under Alternatives 1 and 2, vehicle noise, dust, and traffic interruption would increase in the southeastern part of the permit area compared to the present use. Under Alternatives 3A and 3B, a similar increase would be seen in the northern and central parts of the area. Alternative 4 would continue these effects about the same as the present use. Under Alternative 5, these maneuver effects would end.

Timber Industry - Short-term effects of Alternatives 1, 2, 5, and 6 are expected to be slightly positive, and those of Alternatives 3A, 3B, and 4 roughly the same effects as the present use. Long-term effects of Alternatives 1, 2, 3B, and 4 are expected to be neutral, i.e., not much different from the present use. In the long term, Alternative 3A should add slightly to the timber base, and Alternatives 5 and 6 will add more to this resource.

The economic effects of the harvest (related to the proposed construction activites) and sale of the several million board feet of timber could be severe without planning and scheduling. This is because the amount of timber to be removed is almost as much as is harvested each year from the De Soto National Forest. The Forest Service, however, plans to spread the sale and harvest of the required timber over a period of at least 4 years. The Forest Service believes that, with changes to other sales schedules, the extra sales may be made without hurting the Forest Service mission. Because the 25% county returns on sales will continue to be given to each county within the De Soto National Forest. The 25% county returns are not expected to change.

Biodiversity - Local biodiversity will be slightly affected by a net increase in open area caused by the forest modifications required to implement Alternatives 1, 2, and 3B. Some changes in biodiversity and wildlife species balance and numbers are expected with Alternatives 1, 2, and 3B. Species which like edges and cutover areas will likely benefit from timber removal, trail construction, and tracked vehicle activity. Alternative 3A would clear much less area, and no major change is predicted for either Alternative 3A or 4. Reforestation which goes along with Alternatives 5 and 6 should improve biodiversity. Short-term and long-term scores are the same, and the changes in species balance over time are difficult to predict. Alternatives 1, 2, and 3B should slightly impact biodiversity among native species, although they may help some common game species.

Threatened, Endangered, and Sensitive Species - Current guidelines for threatened, endangered, and sensitive species (T, E, & S) for both the military and the Forest Service require that there be no major harmful effects, and preferably positive effects, on these species for all alternatives or management practices. All planned actions will be tailored to accommodate these species in all cases. Thus, no changes should take place under Alternatives 1, 2, 3A, and 4, and small gains are expected under Alternatives 5 and 6. Two

recent Biological Opinions from the U.S. Fish and Wildlife Service find that any alternative except Alternative 3B may be carried out without harm to the gopher tortoise. Management and protection of threatened and endangered species found at Camp Shelby will continue to be coordinated with the U.S. Fish and Wildlife Service and the Forest Service regardless of which alternative is chosen. Gopher tortoise (*Gopherus polyphemus*) and red-cockaded woodpecker (*Picoides borealis*) management will follow the biological opinions issued by the U.S. Fish and Wildlife Service to the National Guard Bureau and the Forest Service. Therefore, no significant negative impact to these species is expected from any alternative except 3B, which the Army does not propose to select.

Natural Resources - In the short term, natural resources such as vegetation cover, soils, and wetlands may be negatively affected by implementation/construction of Alternatives 1, 2, and 3B. Alternative 3A will result in less short-term damage. In the long term, these effects will be mitigated and Alternatives 5 and 6 are anticipated to be only slightly more positive. Alternative 4, following implementation of new protective strategies, is expected to have small improvements in both short and long term.

Military Training Requirements - Training requirements will be met in full only with implementation of Alternative 1. Alternatives 2 through 4 will meet requirements equal to or slightly better than at present, but Alternative 6 will meet none. Alternative 5 will meet a sub-set of requirements, but is considerably less adequate than the current capability. Long-term needs (i.e., beyond 10 years) for training requirements may change due to changing National Military Strategy.

Table S-3 Environmental Impacts With Mitigation Actions (Short Term - Less than 10 Years)

Scores range from "+++" (meaning definitely helpful), through "0" (zero) (meaning no net change overall), to "– – –" (meaning definitely harmful)

	Alternative						
Environmental Topic	**1**	**2**	**3A**	**3B**	**4**	**5**	**6**
Regional Economy & Employment	0	0	0	0	0	–	– –
Outdoor Recreation Availability	+	+	0	0	0	0	+
Quality of Life	–	–	–	–	0	+	++
Timber Industry	+	+	0	0	0	+	+
Biodiversity	–	–	0	–	0	+	+
T, E and S Species	0	0	0	– – –	0	+	+
Natural Resources	– –	– –	–	– –	+	++	++
Military Training Capability[1] (with new training facilities)	+++	++	++	+	+	– –	– – –

[1] - Not an environmental topic, but included for purposes of comparison.

Table S-4 Environmental Impacts With Mitigation Actions (Long Term - Beyond 10 Years)

Scores range from "+++" (meaning definitely helpful), through "0" (zero) (meaning no net change overall), to "– – –" (meaning definitely harmful)

	Alternative						
Environmental Topic	**1**	**2**	**3A**	**3B**	**4**	**5**	**6**
Regional Economy and Employment	0	0	0	0	0	–	– –
Outdoor Recreation Availability	+	+	0	0	0	0	+
Quality of Life	–	–	–	–	0	+	++
Timber Industry	0	0	+	0	0	++	++
Biodiversity	–	–	0	–	0	+	+
T, E and S Species	0	0	0	– – –	0	+	+
Natural Resources	–	–	0	– –	+	+	++

PUBLIC REVIEW OF THE DRAFT EIS

The Draft EIS on Military Training Use of National Forest Lands, Camp Shelby, Mississippi was prepared in 1990-1991. It was filed with the Environmental Protection Agency and mailed to 681 agencies, organizations, and individuals on November 21, 1991. The notice for the Draft EIS was published in the *Federal Register* at that time. The public comment period given in that letter was from November 29, 1991 to January 28, 1992. At the request of several persons, the public comment period was extended to March 1, 1992. All comments were responded to regardless of date of receipt.

Three public meetings were held (at Jackson, Gulfport, and Hattiesburg, Mississippi) in January 1992. They were attended by a total of more than 300 persons. The questions or concerns of people attending the meetings were collected on comment sheets given out during the meeting. A court stenographer was available to record statements for people who preferred dictating their comments. Written statements prepared prior to the meetings were also accepted at that time. During the public comment period, comments on the Draft EIS were received from 321 agencies, interested organizations, and individuals. In all, more than 2,200 comments, questions, issues, or concerns were identified. Volume III of the Final EIS contains the responses to comments received on the Draft EIS.

Major Types of Comments and Questions Received

In analyzing the comments, the following major issues were identified as being the most frequently occurring. All had been raised during the scoping process in 1990, and were covered in the Draft EIS, but added focus was placed in these areas in writing the Final EIS. The response to public and agency comments is contained in Volume III of the Final EIS.

Mission and need: Is there really the need for battalion level task force tracked vehicle maneuver training when the Armed Forces are reducing numbers, and/or why is there a need to conduct it at Camp Shelby?

Biodiversity: Will this action adversely affect the biodiversity of the coastal regional ecosystem?

Need for adequate mitigation: Is the mitigation (compensation) to be proposed for negative effects to wildlife and wetlands adequate, and will the mitigation be appropriate and clearly described in the Final EIS?

Forest fragmentation: Will making the proposed maneuver areas greatly fragment the present forest stands and harm the forest ecosystem, especially for neotropical migrant bird species?

Road closures: Will building the new maneuver areas cause public roads to be closed while training areas are in use, which will cause delays and safety concerns?

Access to public resources: Will making the proposed maneuver areas in the heart of the Leaf River Wildlife Management Area cause access to this and other recreational areas to be decreased more than is reasonable?

Soil erosion and soil damage: Will disturbance to soils from maneuvering and other activities cause severe erosion problems and resulting sedimentation of streams? A related issue is the possibility that soils may be damaged through compaction when maneuver training takes place on wet soils.

Wetlands: Will vehicle and troop activities in the new maneuver areas cross and damage wetlands, and will soil erosion from the maneuver areas damage nearby wetlands?

Threatened and endangered species: Will the Final EIS better cover the effects that the proposed actions will have on threatened, endangered, and sensitive species, particularly the red-cockaded woodpecker and the gopher tortoise?

Common Concerns of the Proposed Action

There were numerous comments raised by the public that indicate a need to provide more clarity about the nature of the action proposed. The responses to these public concerns can be summarized as follows:

1. Camp Shelby training site will not be expanded.

2. There will be no live firing in the proposed maneuver areas.

3. There will be no increase in the number of soldiers and tanks that train at Camp Shelby.

4. The National Guard has no intention to ask for a "land swap" or "land exchange".

5. Everything within the outer boundary of the proposed training areas will not be clearcut and used for tracked vehicle training.

6. Periodic military training has and continues to take place in the proposed training areas.

7. The Leaf River Wildlife Management Area is part of and is managed in the same manner as the remainder of the De Soto National Forest.

8. The De Soto National Forest is a second growth pine ecosystem, containing stands of many species in addition to longleaf pine.

9. The need exists for military training in areas other than deserts and grasslands. In addition deserts and grasslands require substantial recovery periods.

10. Civilian recreational uses on the proposed training areas will be continued at or near present levels.

HOW DOES THE 1991 TRAINING FACILITIES EIS RELATE TO THIS EIS

A separate EIS was prepared between 1985 and 1991 by the Mississippi National Guard for the building of ranges and buildings to improve existing training facilities or constructing new ones at the Camp Shelby training site. A Record of Decision (ROD) was signed by the National Guard in May 1991. The 1991 EIS studied the impacts of building 14 facilities in the developed area and 5 facilities in the training area. All the facilities considered in the 1991 EIS have been considered in this EIS.

The Multi-Purpose Range Complex - Heavy (MPRC-H) and the Tactical Aviation Areas were covered in the 1991 EIS, but were not included in the ROD for that EIS. It was decided that they needed to be studied in greater detail in the current EIS. The current EIS also studies the present Tank Table VIII (tank firing range) project. Improving Tank Table VIII would involve upgrading of the present Range 45 with new culverts, lead-off ditches, and fill to support more tank traffic. Six facilities projects are proposed to be built in one or more of the alternatives proposed in the current EIS.

CONCLUSION

The Army's preferred alternative is based on the need to have a training area which will be good for tracked vehicles which can be used at the same time that tank gunnery ranges are in use. This cannot be accomplished at Camp Shelby with its current range and tracked vehicle maneuver area configuration.

Alternative 1 will allow enough area so that both gunnery and maneuver can take place at the same time. As we have said, this alternative will also be the most costly to build and maintain. If there are not enough funds for complete repair of all environmental problems, then an alternative which has less training area, but also less cost, may be considered. Alternative 1 may have to be modified, or parts of it added to other alternatives. The Forest Service controls the final wording of the Special Use Permit, and they may also wish to make changes based on public concerns.

Thus, full completion of Alternative 1 may not be possible. The need for the training which Alternative 1 will allow does not end however. We may continue to have this need unfilled for many years, and the Army may have to accept less than the best levels of military readiness as a compromise between Army needs and other priorities. Responsibility to monitor and mitigate the effects resulting from implementation of this action are acknowledged by the proponents.

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Final
Environmental Impact Statement

Military Training Use of National Forest Lands: Camp Shelby, Mississippi

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Military Training Use of National Forest Lands at Camp Shelby, MS

The following Table of Contents includes all those chapters and related sections that comprise Volume I, the Final Environmental Statement (EIS) for Camp Shelby. Note that two additional volumes are available: Volume II "Appendices" and Volume III "Response to Comments."

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LIST OF ACRONYMS AND ABBREVIATIONS

These acronyms and abbreviations are utilized at least once in the document. Some were created for this study; most are standard Department of Defense or Forest Service terminology. Many of these terms are further explained or defined in the Glossary, following.

AEHA	Army Environmental Hygiene Agency
AGL	above ground level (of aircraft in flight)
AGR	Active Guard Reserve
AN-TV Q2 GVLLD	Ground / Vehicle Laser Locator Designator
APC	armored personnel carrier
ARNG	Army National Guard
ARTEP	Army Training and Evaluation Program
ASP	ammunition supply point
AT	Annual Training
ATC	Air (Route) Traffic Control Center
ATLAM	Army Training Land Analysis Model
ATT VIII	Automated Tank Table VIII
ATV	all terrain vehicle
ATWF	automated tank wash facility
AVUM	Aviation Unit Maintenance Platoon
BCRD	Black Creek Ranger District
BCW	Black Creek Wilderness
CA	combat arms
CALFEX-AA	combined arms-live fire exercise - assembly areas
CAD	computer-aided design
CCC	Civilian Conservation Corps
CCF	hundred cubic feet (of timber)
CFR	Code of Federal Regulations
CFX	command field exercise
CITA	close-in training area
CPX	command post exercise
CRTC	Combat Readiness Training Center
CS	combat support
CSS	combat service support
CSTS	Camp Shelby Training Site
CTMA	consolidated tank maneuver area
DEIS	draft environmental impact statement
DBH	diameter at breast height (of trees)
DA	Department of Army
dB	decibels
dbh	diameter breast height
DOD	Department of Defense
DZ	drop zone
EA	environmental assessment or, in context, environmental awareness

ECMP	Erosion Control Management Plan
EIFS	Economic Impact Forecast System
EIS	environmental impact statement
EMAP	environmental management and analysis plan
EPW	enemy prisoner of war
EOD	explosive ordnance disposal
ETIS	Environmental Technical Information System
FAA	Federal Aviation Administration
FARP	forward arming refueling point
FHD	foliar height diversion
FM	field manual
FORSCOM	Forces Command
FSB	forward support battalion
FTX	field training exercises
FY	fiscal year
GAO	Government Accounting Office
GIS	geographic information system
GRASS	Geographic Resources Analysis Support System
GT	Gopher Tortoise
GS	general schedule
HEMTT	heavy expanded mobility tactical truck
HMMWV	high mobility multi-purpose wheeled vehicle
HNDM	Huntsville Division Manual
HP	high potential
HPP	historic preservation plan
HYVAR X-L™	Commercial herbicide
Hz	Hertz
ICUZ	installation compatible use zone
IDT	Inactive Duty Training
IFV	infantry fighting vehicle
ITAM	Integrated Training Area Management
IFV/CFV	infantry/calvary fighting vehicles
KV	Knutson - Vandenburg Act
LAC	limits of acceptable change
LAW	light anti-tank weapon
LCTA	land condition trend analysis
LFX	live fire exercises
LRAM	Land Rehabilitation And Maintenance
LRMP	Land and Resource Management Plan
LRWMA	Leaf River Wildlife Management Area
LURS	Land Use Requirements Study
MAPEX	map exercises
MBF	thousand board feet
MMBF	million board feet
MCOFT	mobile conduct of fire trainer

MDWFP	Mississippi Department of Wildlife, Fisheries and Parks
MEDEVAC	medical evacuation
MGD	million gallons per day
MILES	Multiple Integrated Laser Engagement System
MMA	Mississippi Military Academy
MOA	military operations areas
MOU	memorandum of understanding
MOUT	military operations in urban terrain
MPRC-H	Multiple Purpose Range Complex-Heavy
MS	Mississippi
MSARNG	Mississippi Army National Guard
MSL	mean sea level
NEPA	National Environmental Policy Act
NBC	nuclear biological chemical
NCO	Non-commisioned Officer
NF	National Forest
NFS	National Forest System
NGB	National Guard Bureau
NOAA	National Oceanographic Atmosphere Administration
NOE	nap of the earth
NOI	notice of intent
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NVG	night vision goggles
OA	operational area
OASA-IL&E	Office of the Assistant Secretary of the Army for Installations, Logistics, and Environment
OB/OD	open burning/ open detonation
OMS	organizational readiness shop
OPORD	Operations Order
PAS	preliminary assessment screening
PCMS	Piñon (or Pinyon) Canyon Maneuver Site
PL	public law
POL	petroleum, oil and lubricants
PPB	parts per billion (1×10^{-9})
PSD	plant species diversion
PTA	proposed training area
QOL	quality of life
RC	Reserve Component (units)
RCRA	Resource Conservation and Recovery Act
RCW	Red-Cockaded Woodpecker
RFP	request for proposal
REDCON	readiness condition
ROD	Record of Decision
ROTC	Reserve Officer Training Corps

RS&D	receiving, staging and deployment (operations)
RTV	rational threshold value
RUSLE	revised universal soil loss equation
SCS	Soil Conservation Service
SHPO	State Historic Preservation Officer
SOP	standard operating procedure
SPT	stationary personnel target
STAB RUN	stabilization run
STX	situational training exercises
SUP	special use permit
T	tracked (used as a prefix)
TA	training area
TAA	tactical aviation area
TBM	technical bulletin (medical)
TC	training circular
TCPC	tank crew proficiency course
T&E	threatened and endangered
TE&S	threatened, endangered and sensitive
TEWT	tactical exercises without troops
TM	technical manual
TOC	tactical operations center
TOW	tube launched, optically tracked, wire-guided (anti-tank missile)
TRADOC	U.S. Army Training and Doctrine Command
TRI	training requirements integration
TY	training year
UNIX™	computer operating system developed by Bell Laboratories
USACE	U.S. Army Corp of Engineers
USACERL	U.S. Army Construction Engineering Research Laboratory
USAEWES	U.S. Army Engineer Waterways Experiment Station
USAF	U.S. Air Force
USDA-SCS	U.S. Department of Agriculture - Soil Conservation Service
USDA-FS	U.S. Department of Agriculture - Forest Service
USFWS	U.S. Fish and Wildlife Service
UTM	universal transverse mercator

GLOSSARY

A-weighted - General environmental noise from a continuous source.

Air (route) Traffic (control) Center - A regional office of the FAA which exercises active control over aircraft on instrument flight plans in its region.

AirLand Battle - The U.S. Army's basic fighting doctrine suggesting an aggressive offensive position; including the securing and retaining of the initiative, and maneuvering of combined arms teams, tracked vehicles, and aircraft.

Ammunition Supply Point (ASP) - Area where ammunition is stored and issued to troops using firing ranges as required.

Annoyance Zone - The area in which low level aircraft flights annoy residents.

Anti-Tank Weapons - Rockets and small missiles designed to defend against enemy armored vehicles.

Aquifer - Water bearing rock, rock formations or groups of rock formation.

Armor Battalion - (see *Battalion*)

Armor Unit - (see *Unit*)

Armored Brigade - (see *Brigade*)

Army Environmental Hygiene Agency (AEHA) - An office of the Army Surgeon General which is responsible for regulating potential hazards to the health of military personnel.

Army National Guard (ARNG) - Military reserve units controlled by each state, equipped by the federal government, and subject to the call of either federal or state government.

Army Training Land Analysis Model (ATLAM) - This model was developed to determine how much land is needed to conduct a certain type of level of training.

Attack Zone - Geographical area where attack begins.

Battalion - A military unit consisting of a headquarters company and three to five functional (combat arms, combat support or combat service support) companies (approximately 250 to 1,000 persons, depending on the type of unit). Types of battalions referred to in the Final EIS are armor and mechanized infantry. (See *mechanized* for further explanation.)

Benthic Macroinvertabrates - Loosely classified as bottom dwelling organisms such as snails, clams, and larval insects.

Berms - An earthen ridge created to provide concealment or to protect an emplacement from enemy fire.

Biodiversity - The variety of genetic combinations, species functions and associations occurring in an area, and the degree representative of the indigenous flora and fauna. The Camp Shelby EIS Biodiversity Conflict Resolution Committee (formed in 1992 to examine the biodiversity issue) came up with a new definition in which all parties agreed upon (Section 1.1.4.3, p. 1-47).

Biodiversity Conservation - Efforts at maintaining and preserving the complete variety of endemic species in an area (see *Biodiversity*).

Biogeography - Study of the geographic distribution of plants and animals.

Biological Assessment - The information prepared by or under the direction of a Federal agency concerning listed and proposed species and designated and proposed critical habitat that may be present in the action area, and the potential effects of the action on such species and habitat.

Biological Evaluation - A Forest Service-required evaluation of all Forest Service programs and activities planned, funded, executed or permitted for possible effects on proposed, endangered, threatened and sensitive species.

Biological Opinion - The document that states the opinion of the U.S. fish and Wildlife Service as to whether or not a proposed Federal action is likely to jeopardize the continued existence of a Federally listed species, or will result in the destruction of adverse modification of a critical habitat.

Biomonitoring - The systematic use of biological responses (species, populations, communities, community functions) to evaluate changes in the environment.

Biomonitoring Plan - A plan to use biomonitoring to evaluate changes in the environment.

Bivouac Sites - A temporary encampment made by soldiers in the field; on fixed installations such as Camp Shelby, often provided with improved water supply, portable toilets, etc.

Bradley Fighting Vehicle - A modern armored personnel carrier approximately one-third the weight of a tank with weapons lighter than a tank and designed to fight with tanks on a crowded battlefield. Also called the Infantry Fighting Vehicle (IFV) or Cavalry Fighting Vehicle (CFV).

Brigade - A military unit composed of several battalions, augmented by specialized units (up to approximately 5,000 persons, depending on the type of unit).

Buffer Zone - (In the context of this EIS) A strip of untouched vegetation between any maneuver area and a wetland, endangered or threatened species colony, or other sensitive area.

Burn Pans - Shallow welded metal pans in which waste explosives and powder are placed before burning for containment and collection of any potentially hazardous residue.

C-weighted - Impulse noise, not from a continuous source.

CCF - Hundred cubic feet - A measurement of timber volume used in this document for small roundwood (the first "C" meaning 100 in Roman numerals). Converted to MBF for reporting purposes by multiplying by .77.

Cantonment Area - The developed portion (city-like area) of a permanent military installation.

CAPSTONE - An Army program that aligns Reserve units with Active Component higher headquarters that they would go to war with.

Caralogs - Animal drawn carts used in timber harvesting.

Civilian Conservation Corps - A U.S. government conservation agency active from 1933 to 1943.

Close-in Training Area (CITA) - Areas closed to built up parts of an installation where small-scale repetitive training is conducted and located within the Cantonment Area.

Combined Arms - The concept of having teams of soldiers armed with different weapons and skills working together to accomplish some mission.

Combined Arms-Live Fire Exercise Assembly Areas (CALFEX-AA) - The waiting/staging area for vehicles of a combined arms team scheduled to begin marksmanship exercises; may or may not include concurrent training (q.v.) at this location.

Commensal - Term used to describe the act of living together in harmony of two different species. One or both may benefit, but neither is harmed.

Concurrent Training - (In the context of this EIS) Concurrent training incorporates instruction which takes place while a person or crew is awaiting a place at a live fire range or course. The instruction is of a type designed to reinforce or prepare for the live fire session.

Company - The next smaller unit of a battalion, the most basic administrative and tactical unit (approximately 50 to 200 persons, depending on the type of unit).

Consolidated Tank Maneuver Area - The previously developed plan (circa 1982-84) for making Camp Shelby better suited to conduct training; was superseded when AirLand Battle doctrine became effective.

Construction Engineering Research Laboratory - A research activity of the Corps of Engineers; preparers of this EIS. (USACERL is also used in Final EIS.)

Contamination - (In the context of this EIS) Unexploded artillery rounds and other ammunition which has remained in the ground for decades.

Corridors - Trails to move to and from training areas.

Corridor Sets - A group of proposed maneuver corridors which are required to provide access to and from proposed training areas.

Defilade Positions - Positions, usually earthen berms, giving protection from incoming fire while providing a semi-protected firing position.

Diameter at Breast Height - Measurement of tree diameter four feet six inches above ground level.

Dragon - Man packed medium antitank weapon.

Drawdown - A reduction of the water level in a reservoir or groundwater table.

Drop Zone Areas - Cleared, grassed areas used for parachute drops and air-mobile troop deployment.

Economic Impact Forecast System (EIFS) - Export-based, location-quotient economic model developed by USACERL to estimate the regional economic impact of Army actions.

Edge Habitat - Interface between closed forest and clearings or roadways; favored habitat of many commonly harvested game species.

Emplacement - A prepared position for guns within a fortification.

Ephemeral Channel - A stream or portion of a stream that flows only in direct response to precipitation, and receives little or no water from springs or no long continued supply from other sources, and its channel is always above the water table.

Equalization Basins - The facility for equalizing the flow of wastewater from a vehicle wash facility; a timed/regulated release to the water treatment system.

Exotic Species - "Non-native" species or species not endemic to an area.

Field Sanitation - "Field sanitation" refers to latrines.

Firing Fans - A safety zone drawn around the target area; this includes the area where the projectile is supposed to strike, an additional area for flying fragments or ricochetting shells, and a third area set aside as a further safety buffer zone.

Firing Lanes - The line of positions from which fire is directed against a target.

Firing Points - The location at which a vehicle or weapon is positioned for firing at a target.

Firing Range - The area or group of firing points designed for use by a particular weapon.

Fixed Wing Platoons - (see *Platoon*)

Forb - Any herb that is not a grass or grasslike.

FORSCOM - U.S. Army Forces Command, which is a major Army command, responsible for training units to operate together on the battlefield.

Georeferenced Image - An aerial or satellite scan or photo which has been tied to reference points on the ground.

Hardstand - An area with a hard surface which may be used for parking planes or ground vehicles.

Heavy Expanded Mobility Transport Truck (HEMTT) - Heavy truck that can operate off-roads and carry supplies for the fighting units.

Herpetofauna - Collectively, the resident Amphibians and Reptiles of an area.

Historic Preservation Area - An historic properties protection and compliance document prepared for an Army installation. The objectives of the plan are to integrate historic preservation requirements with the planning and conducting of military training, construction, and other undertakings, and real property or land use decisions; to set up a legally acceptable compliance procedure with the State Historic Preservation Officer; to set priorities for field, analytical, and documentation projects designed to acquire information needed to develop, evaluate, and manage the inventory of significant historic properties; to establish a procedure to evaluate historic properties; to rank the installation undertakings by their potential to damage to historic properties; to provide guidelines for the protection or treatment of historic properties; and to identify funding, staffing, and milestones.

Hydrophytic - Water adapted.

Impact Area - The area where projectiles fired in gunnery practice are aimed.

Impulse Noise - Environmental noise characterized by relatively widely spaced high energy, low frequency sources: heavy weapons and helicopter blade rotors are two common military sources.

Infantry Fighting Vehicle - (see *Bradley Fighting Vehicle*).

Installation Compatible Use Zone - A land use planning procedure employed to control environmental noise.

Integrated Training Area Management (ITAM) - The Army's land management process that allows decision makers to make more informed land and wildlife management decisions. (Refer to Appendix G.)

Intermittent Stream - A stream or portion of a stream that ordinarily flows during the winter and spring months, but ceases to flow during the drier seasons. These streams will have well define stream channels.

K-Value - A measure of potential ability of a soil to erode.

KV Fund - Monies authorized by the Knutson-Vandenburg Act of June 9, 1930 to be deposited by purchasers of National Forest timber for sale area betterment work. See Appendix O.

Land and Resource Management Plan (LRMP) - The plan for a National Forest or group of National Forests which guides all natural resource activities and establishes management standards and guidelines.

Limits of Acceptable Change (LAC) - A system for wilderness planning instituted by the U.S. Forest Service.

Maneuver Area - The area in which military exercises take place.

Maneuver Corridors - A tract of land providing access between maneuver areas.

MBF - Thousand board feet - A measurement of timber volume equivalent to one thousand pieces of lumber one inch thick, one foot wide and one foot long (The "M" meaning 1,000 in Roman numerals). In this document it refers to measurement by the Scribner Log Rule.

Mechanized - Generally refers to a unit or larger military body which moves into battle on wheeled or tracked vehicles rather than on foot.

Memorandum of Understanding (MOU) - An agreement, usually between governmental agencies representing different departments, for cooperation toward some mutual goal.

Mitigation - (In the context of this EIS) To make less harsh or severe; to alleviate effects; includes the concept of avoidance of the problem.

MMBF - Million Board Feet - A measurement of timber volume equal to 1000 MBF (q.v.). In this document it refers to measurement by the Scribner Log Rule.

Mobile Conduct of Fire Trainer (MCOFT) - Computer simulation facility utilized by armor units to practice aiming and firing the main battle tank.

Multiple Integrated Laser Engagement System (MILES) - "Eye-Safe" LASER system in which the total power or energy output can be concentrated in the unprotected human eye without irreversible visual damage; used in simulated combat situations to score a hit on an opponent.

Multiple Purpose Range Complex-Heavy (MPRC-H) - A gunnery range designed for use by armored vehicles operating together in teams, and also potentially with aircraft.

National Environmental Policy Act (NEPA) - PL 91-190, 1 Jan 1970 - The law requiring Federal governmental agencies to consider the environment when planning and executing major actions.

National Register of Historic Places - The listing of the officially recognized historical structures, places, buildings, objects and districts; under the authority of the U.S. Department of the Interior; operated by the National Park Service.

Native American Graves and Repatriation Act (3-193) - Federal law passed to protect Native American burial sites.

Naval Stores - Tar, turpentine, and other by-products distilled from pine pitch; based on their importance in construction and maintenance of wooden ships.

Nuclear, Biological, and Chemical Element - That part of the operations center which performs the primary functions of coordinating chemical and biological defensive actions with other support operations, predicting fallout resulting from the employment of nuclear weapons by friendly and enemy forces, and evaluation of chemical, biological, and radiological contamination: in the context of this EIS, all such training activity is simulated.

OBERS - Estimates of regional economic activity prepared by the U.S. Department of Commerce, Bureau of Economic Analysis.

Off Limits Areas - Restricted areas into which troops cannot intrude due to the presence of threatened or endangered species or wetland areas; also, areas into which civilians cannot enter due to possible danger.

Operational Area - All areas within the operational boundary of Camp Shelby, the lands being largely owned by the U.S. Forest Service.

Perennial Stream - A stream or portion of a stream that flows continuously with the *possible* exception of during extended dry periods. These streams have well defined stream channels.

Piñon Canyon Maneuver Site - A sub-installation of Fort Carson, CO, which was purchased by the U.S. Army in 1985 for use as a field maneuver site.

Pitman Roberston Act of 1937 (pg. 2-44) - Federal wildlife legislation.

Platoon - Military aviation units who conduct *fixed-wing* (airplane) or *rotary* (helicopter) activities.

Proposed Training Area (PTA) - Training areas, already within the boundaries of Camp Shelby, which are proposed by this EIS to be developed to provide more adequate training configurations for Camp Shelby's Training activities.

Public Domain - The land for the general public's use and enjoyment.

Public Involvement - The process whereby the opinions and concerns of members of the public are incorporated into a governmental study and/or the decision making process.

Pure Maneuver Battalion - (See *Battalion*).

Pyrotechnics - Ammunition containing chemicals that produce smoke or brilliant light in burning; used for signaling or lighting areas.

Rational Threshold Value - An estimate of a region's ability to undergo an economic change without undue hardship; based on changes the region had actually experienced in the preceding decade.

Record of Decision (ROD) - The official finding prepared by the proponent of an action as to which alternative will be selected; prepared following completion and filing of the Final EIS.

Resource Conservation and Recovery Act - PL 94-580; 1976 - The act established criteria for the management of hazardous wastes; i.e. handling, disposal and record keeping

Riparian (buffer) - A buffer along a wetland or stream.

Safety Fan - The bounds set around target areas on a firing range; includes an additional area around the danger zone.

Sally Port - Overall arms weapons ports in the sides of Bradley Fighting Vehicles.

Sand Filters - A filter system containing a granular medium for water purification through physical and/or biological means; in this EIS, receives wastewater from the equalization basins of a vehicle wash facility.

Scoping - The process defined by the National Environmental Protection Agency (NEPA) regulations for focusing the contents of an EIS on issues most relevant to a specific action in a specific location.

Sedimentation Basin - A receptacle immediately downstream of a vehicle wash facility; designed to settle and contain solids and semi-solids from the waste.

Sensitive Species - Those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by a) significant current or predicted downward trends in population numbers or density; and b) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Small Arms Fire - Firing or marksmanship training involving small caliber arms; i.e. pistols, rifles, and/or light machine guns.

Snags - Dead, but standing, trees.

Sorties - Flights.

Special Use Permit (SUP) - A type of permit issued by the appropriate planning agency to allow for special uses of the land which are different from stated zoning or designated uses.

State Historic Preservation Officer - The official designated by the governor of a state to be ultimately responsible for the preservation of all historic and archeological resources located in the state.

Stumpage - Standing trees.

Stumpwood - Pitch soaked stumps, originally from virgin pine trees, which were dug up and processed for naval stores (q.v.).

Tactical Aviation Areas (TAAs) - The cleared areas in which helicopter units would assemble and prepare for participation in combined arms maneuvers.

Tank Ditches - A lateral ditch, dug as part of a defensive practice to restrict tank movement.

Tank Fan - A barricaded area around tank ranges inside which all ordnance should fall.

Tank Table VIII - An automated target firing course through which armored vehicles drive to improve marksmanship of the crew from a moving vehicle as well as from fixed firing points.

Tank Wash Facility - A concrete structure designed specifically to clean tracked and wheeled military vehicles.

Target Acquisition Lasers - Laser range finders on tanks, ground vehicle laser locator/designator.

Task Force - A battalion sized unit which possesses all skills and weaponry necessary for effective tactical use.

Tracked Vehicle - A mechanized vehicle which travels on two or more endless tracks mounted on each side of the vehicle; exhibits high degrees of mobility and maneuverability; as used here, includes primarily tanks, armored personnel carriers and self-propelled artillery.

Training and Doctrine Command (TRADOC) - One of the Army's major commands, responsible for training soldiers in individual skills (e.g., firing a machine gun, repairing radio, driving a truck).

Training Requirements Integration (TRI) - The main component of Integrated Training Area Management.

Units - A standard military term for a group of up to 5,000 persons to conduct a specialized function.

Universal Transverse Mercator - A system of metric coordinates similar to latitude and longitude upon which all Department of Defense mapping and GRASS-GIS systems are based.

Wetlands - Land lying above the floodplain and subject to inundation by floodwater on a sporadic basis.

TABLE OF MEASUREMENT EQUIVALENCIES

The following conversion factors have been taken from the General Services Administration *Preferred Metric Units for General Use by the Federal Government,* January 27, 1993. For conversions not given here or for more detailed explanation, consult the GSA book or *Standard Practice for Use of the SI International System of Units: The Modernized Metric System.*

From	To	Multiply By
	LENGTH:	
foot	meter	0.3048
inch	centimeter	2.54
inch	millimeter	25.4
yard	meter	0.9144
mile	kilometer	1.609344
nautical mile	kilometer	1.852
	AREA:	
square inch	square centimeter	6.4516
square inch	square millimeter	645.16
square foot	square meter	0.09290304
square yard	square meter	0.8361274
	VOLUME:	
barrel, oil (42 U.S. gallons)	cubic meter	0.1589873
barrel, oil (42 U.S. gallons)	liter	158.9873
cubic yard	cubic meter	0.764555
cubic foot	cubic meter	0.02831685
cubic foot	liter	28.31685
gallon	liter	3.785412
quart	liter	0.9463529
pint	liter	0.4731765
fluid ounce	milliliter	29.57353
cubic inch	cubic centimeter	16.38706
	VELOCITY:	
foot per second	meter per second	0.3048
mile per hour	kilometer per hour	1.6093
	FLOW RATE:	
cubic foot per second	cubic meter per second	0.02831685
cubic foot per minute	cubic meter per second	0.000471947

	FLOW RATE (con't)	
cubic foot per minute	liter per second	0.4719474
cubic yard per minute	liter per second	12.74258
gallon per minute	liter per second	0.0630902
gallon per day	liter per day	3.785412
	FUEL EFFICIENCY:	
miles per gallon	kilometer per liter	0.4251437
	MASS (WEIGHT):	
ton (long)	kilogram	1016.047
ton (long)	metric ton	1.016047
ton (short)	kilogram	907.18474
ton (short)	metric ton	0.9071847
slug	kilogram	14.59390
pound	kilogram	0.45359237
ounce, troy	gram	31.10348
grain	milligram	64.79891
	MOMENT OF MASS:	
pound foot	kilogram meter	0.1382550
	DENSITY:	
pound per cubic foot	kilogram\cubic meter	16.01846
	CONCENTRATION (MASS):	
pound per gallon	gram per liter	119.8264
ounce per gallon	gram per liter	7.489152
	PRESSURE, STRESS:	
standard atmosphere	kilopascal	101.325
pound-force per square inch	kilopascal	6.894757
millimeter of mercury	kilopascal	0.1333224
	ENERGY, WORK, HEAT:	
kilowatthour	megajoule	3.6
calorie	joule	4.184
Btu	kilojoule	1.055056
therm (U.S.)	megajoule	105.4804
foot pound-force per second	joule	1.355818
	POWER:	
Btu per second	kilowatt	1.055056
Btu per hour	watt	0.2930711

	POWER (con't)	
horsepower (550 foot pounds-force per second)	watt	745.6999
	horsepower, electric watt	746
foot pound-force per second	watt	1.355818
	THERMAL CONDUCTIVITY:	
Btu inch per hour square foot degree Fahrenheit	watt per meter kelvin	0.1442279
	COEFFICIENT OF HEAT TRANSFER:	
Btu per hour square foot degree Fahrenheit	watt per square meter kelvin	5.678263
	HEAT CAPACITY:	
Btu per degree Fahrenheit	kilojoule per kelvin	1.899108
	SPECIFIC HEAT CAPACITY:	
Btu per pound degree Fahrenheit	kilojoule per kilogram kelvin	4.1868
	SPECIFIC INTERNAL ENERGY:	
Btu per pound	kilojoule per kilogram	2.326
	TEMPERATURE:	
temperature Celsius	temperature Fahrenheit minus 32 divided by 1.8	

ADDENDUM

Some units of concentration are not to be converted unless they are converted in the regulation: mg/L, mg/kg, ppm, and NTU. These concentrations most commonly are associated with water quality.

Final
Environmental Impact Statement

Military Training Use of National Forest Lands: Camp Shelby, Mississippi

Chapter 1

PURPOSE OF AND NEED FOR THE ACTION

1.0 PURPOSE OF AND NEED FOR THE ACTION

The purpose of this action is to renew a Special Use Permit for the use of portions of the De Soto National Forest lands for current and anticipated military training activities by the Mississippi National Guard. Additionally one construction project located on state land within the Camp Shelby cantonment area and one construction project located on Dept of Defense property are evaluated as part of this study.

In response to everchanging global security requirements, the United States National Command Authority is reorganizing its force structure throughout the world. Currently, National Defense Planners are proposing to reduce, over the next several years, the overall military forces of the United States. As the number of Active Component soldiers and airmen decreases, the importance of Reserve Component soldiers and airmen to the overall defense of the nation increases. Greatly increased reliance on the combat readiness of the Reserve Components is expected to be the norm at the turn of the century. Combat readiness can only be attained with the best training facilities the country can provide.

As a result of the adoption of the "Total Force" National Military policy by the United States at the end of the National Military draft era in 1973, reliance upon the Reserve components of the U.S. military establishment has risen dramatically. The recent Gulf War highlighted this reliance as Camp Shelby was the only National Guard Training Site utilized as a Mobilization Station.

1.1 Coverage in this Document

Chapter 1 of this EIS discusses the background and need for the actions proposed for the new Special Use Permit. In Section 1.1.1, the history of military use at Camp Shelby is summarized. Chapter 2 presents the current uses of Camp Shelby in more detail. The issues raised in the scoping process and the comments following public review of the Draft EIS are discussed in Section 1.1.7. A description of the different alternatives explored for improved training in this EIS is given in Section 1.2., while Chapter 3 offers a more detailed analysis of environmental and other impacts of each alternative. Section 1.3 describes the proposed facilities associated with the alternatives. Prior to implementation of any alternative, additional studies will be required, mitigation measures and proposed or continued training will be considered; and environmental documentation will be required. These aspects are discussed in Sections 1.4 and 1.5. Chapter 4 offers final conclusions and recommendations for each alternative.

This Environmental Impact Statement (EIS) examines several aspects of the environmental impacts of military training use of National Forest lands at Camp Shelby, Mississippi. Military training activities on National Forest lands are authorized through the issuance of a Special Use Permit (SUP). The Special Use Permit establishes the levels and types of military training activity that may occur on National Forest lands. This EIS evaluates a range

of alternatives covering various levels of military activity proposed by the proponent, the Department of the Army (DA), National Guard Bureau.

The EIS will disclose and evaluate the environmental impacts associated with various levels of military training activity on National Forest lands. Two federal agencies, the U.S. Forest Service (USFS) and the DA, will utilize this EIS in their decisions concerning Camp Shelby, MS. The USFS will make its decision concerning the issuance of a SUP based upon the finding of this EIS. The SUP will establish the levels and types of military training activities permitted on National Forest lands.

Specific decisions to be made by the Forest Service include; whether or not to authorize use of the National Forest for a special use permit for Camp Shelby and if so:

- What would be the boundary of the SUP and locations and boundaries of permitted training areas.
- Which *types* and *levels* of military activities will be permitted within the training areas.
- Whether or not to permit construction of Tank Table VIII (upgrade of Range 45).
- Whether or not, and if so, where to permit construction of tank access corridors between tracked vehicle training areas.
- Whether or not to permit expansion of tank maneuver use into the Leaf River Wildlife Management Area (LRWMA).
- Whether or not to permit the construction of those training facilities identified in the May 24, 1991, Record of Decision (ROD) by the National Guard Bureau/Mississippi National Guard.
- Whether or not to amend the Forest Land and Resource Management Plan for consistency.
- This EIS conceptually describes the levels and types of future facilities to be constructed in the permitted areas (Multi-Purpose Range Complex - Heavy, Tactical Aviation Areas, and CALFEX Assembly Areas), and a decision will be made on whether or not to permit these facilities. However, final site location will be made after the appropriate site specific analysis has been completed.

The DA will utilize this EIS to verify in the ROD its selected alternative and commitment of manpower and resources to support operations and training activities at Camp Shelby, Mississippi as it relates to proposed activities within the framework of the Special Use Permit.

The original scope of this EIS, dating from January, 1990, included a proposed decision to be made concerning a possible land interchange between the Department of the Army and the Department of Agriculture. It was suggested that land owned by the Army at the Piñon Canyon Maneuver Site, Colorado, be exchanged for National Forest lands in Mississippi (see Section 1.1.4). This is no longer an issue being studied in this EIS. The Piñon Canyon lands were transferred directly to the National Forest System through Congressional action with the passage of the Military Construction Authorization Act for Fiscal year 1991, and is no longer connected to any proposed land interchanges. No National Forest lands in Mississippi or elsewhere are being considered for interchange in this EIS.

The Army identified its preferred alternative in the Draft Environmental Impact Statement in accordance with 40 CFR 1502.14(e) and Army Regulation 200-2. The U.S. Forest Service had no preferred alternative at that stage in the development of the EIS.

This Environmental Impact Statement is being prepared pursuant to the requirements of the National Environmental Policy Act (NEPA) PL 91-190, 40 CFR 1500-1508 and Army Regulation 200-2 to examine the environmental impact of continued and reconfigured training activities at Camp Shelby, MS. The Army's preferred alternative is to reconfigure the tracked vehicle maneuver areas to more closely reflect current military doctrine. This would involve use of approximately the same number of vehicles as current training. Maneuvers would, however, be more complex and would be conducted over different areas. (See Appendix C for a detailed discussion of current use of Camp Shelby). Any continued military use would require the issuance of a new SUP by the USFS.

This study was performed under the management of the U.S. Army Corps of Engineers, Mobile District, using the resources of the U.S. Army Construction Engineering Research Laboratories (USACERL), and with the assistance of the U.S. Army Engineer Waterways Experiment Station (USAEWES). The USFS is a cooperating agency and the U.S. Fish and Wildlife Service (USFWS) and the Mississippi Natural Heritage Program provided data on threatened and endangered species and information on wetlands inventory.

1.1.1 History and Setting of Camp Shelby

Camp Shelby, MS is the largest National Guard Training installation in the United States. The Camp occupies approximately 134,000 acres of land in southeastern Mississippi (Figures 1-1, 1-2, 1-3, 1-4, and Appendix C). The actual ownership is comprised of federal, state and privately owned (leased) lands; the majority being federal lands administered by the U.S. Forest Service (USFS). See Figure 1-3.

Of the approximate 134,000 acre total surface area, the Department of Army (DA) owns about 7,300 acres, about 1,100 acres are privately owned and leased to DA and about 7,900 acres belong to the State of Mississippi. The balance of the land is used under a Special Use Permit (SUP) from the USFS. This SUP provides for military training activities to take place

on approximately 116,639 acres of the De Soto National Forest. The exact acreage has varied slightly over the years.

Camp Shelby lies in southeastern Mississippi and covers portions of Forrest, George, and Perry Counties. About 80 percent of the installation is within Perry County. The headquarters and Cantonment Area are totally within Forrest County. Hattiesburg is the nearest major population center, and is located about 7 miles north-northwest of the installation. The Camp was first used for military training during World War I when troop populations were higher than present. It was deactivated and either transferred to the State or sold to the original owners. The State has used it as a military training location on a regular basis, with great variation in level of use, since the 1940's. The USFS has managed its land as a unit of the De Soto National Forest in keeping with its mission to provide a sustained flow of renewable resources -- outdoor recreation, forage, wood, water, wilderness, wildlife, and fish -- in a combination that best meets the needs of society now and in the future. Currently, intensive training (artillery firing points with impact area, various firing ranges, aviation training, unit bivouac, field training and tracked vehicle maneuver) is carried out under permit from the U.S. Forest Service on the northern section of Camp Shelby (Figure 1-5). In the southeast portion, only non-tracked exercises are carried out under the Special Use Permit agreement between the Army and the USFS (see Appendix A for the provisions of the present permit).

The National Forests in Mississippi Land and Resource Management Plan provides for special use permits under the following standards and guidelines:

- Be responsive to public and private needs for National Forest land and resources through authorized occupancy and use.

- Allow on suitable tracts of National Forest land such uses as are consistent with the overall U.S. Forest Service objectives that cannot be serviced by development on private land.

- Allow uses only on lands suitable for the proposed use, and under conditions which protect the public interest, including the proper consideration of environmental quality and landscape integrity.

Further uses are specifically permitted under a Master Agreement between the Department of Agriculture and Department of Defense (Appendix A).

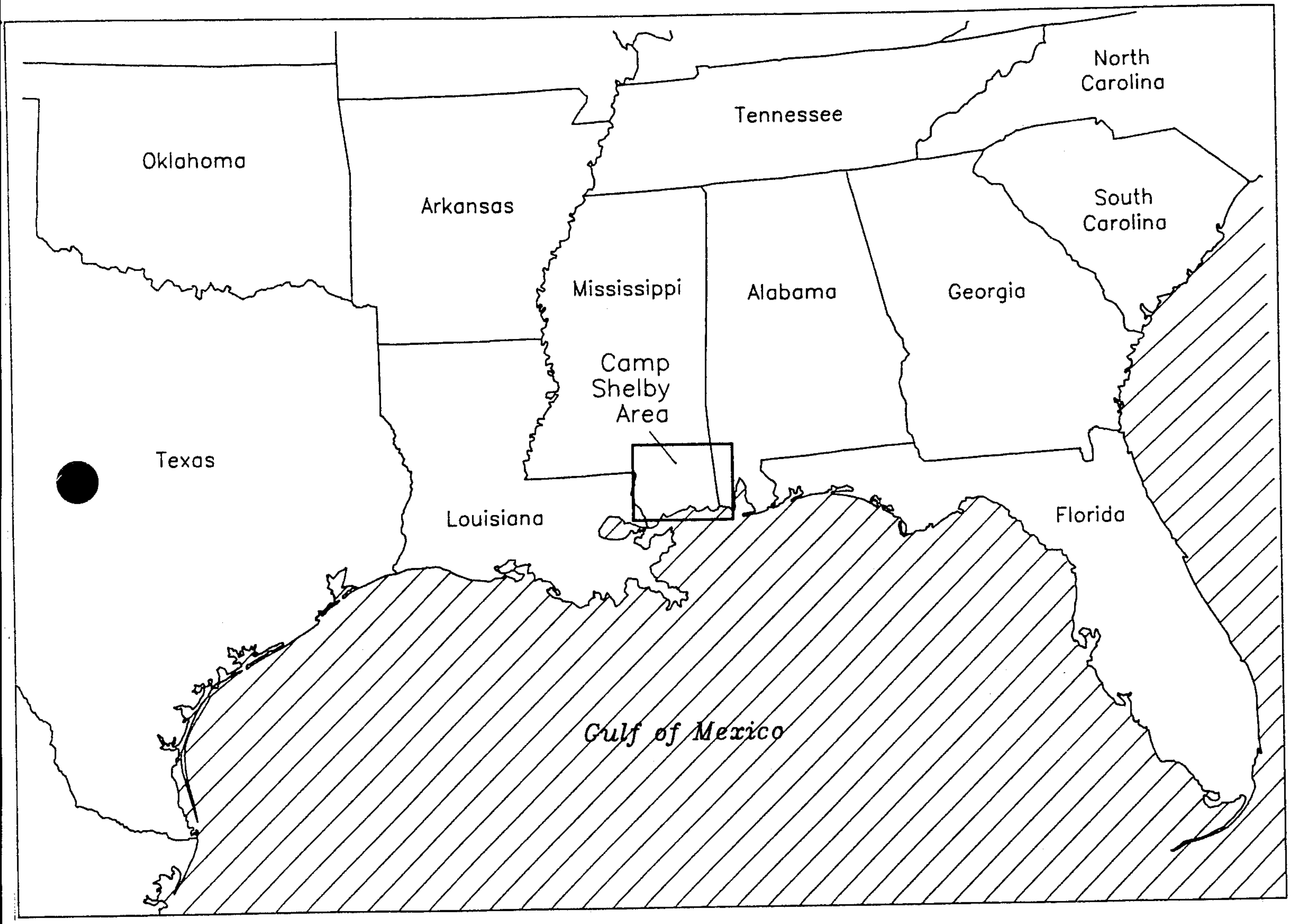

Figure 1-1 Regional Location Map

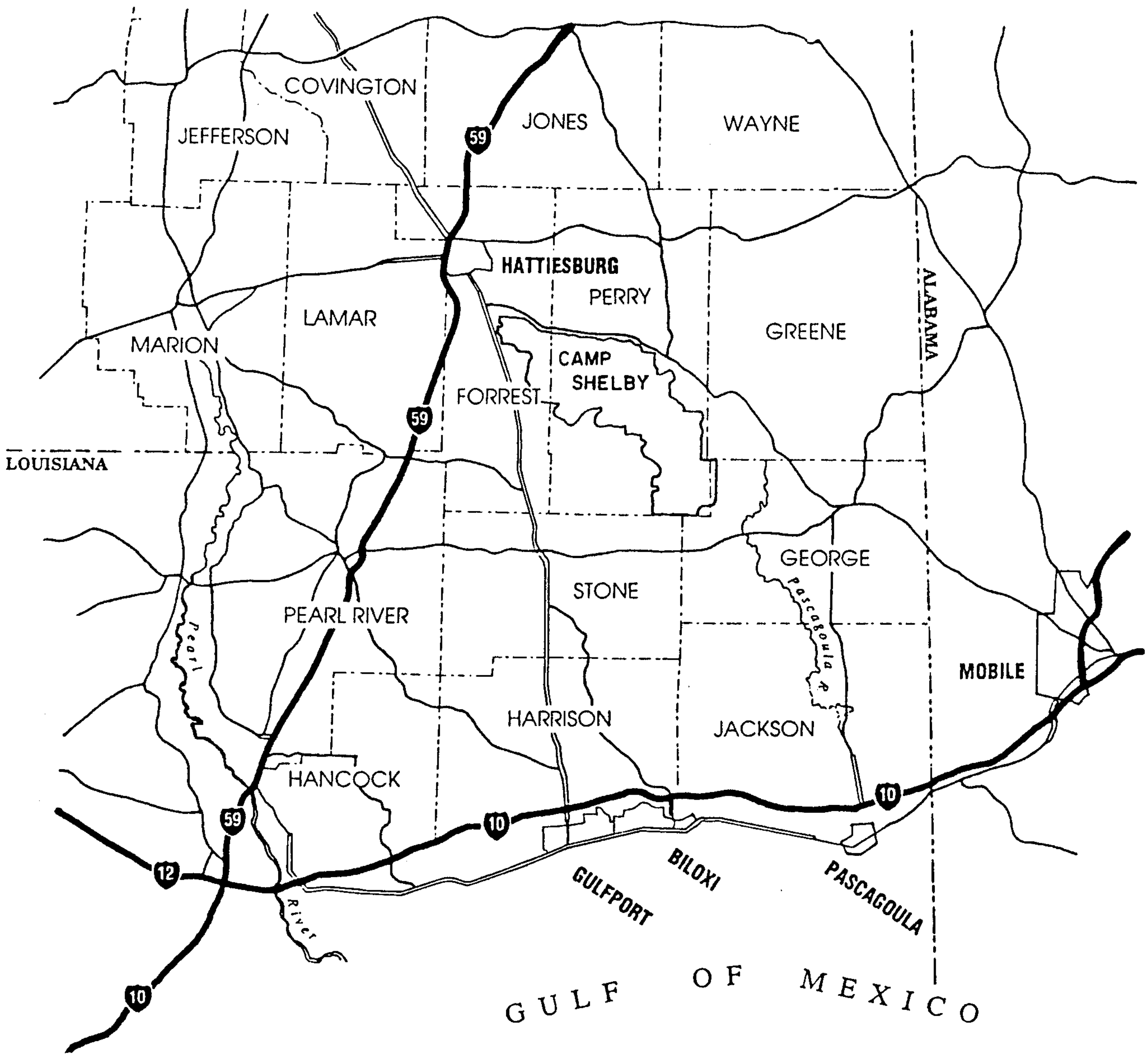

Figure 1-2 Vicinity of Camp Shelby

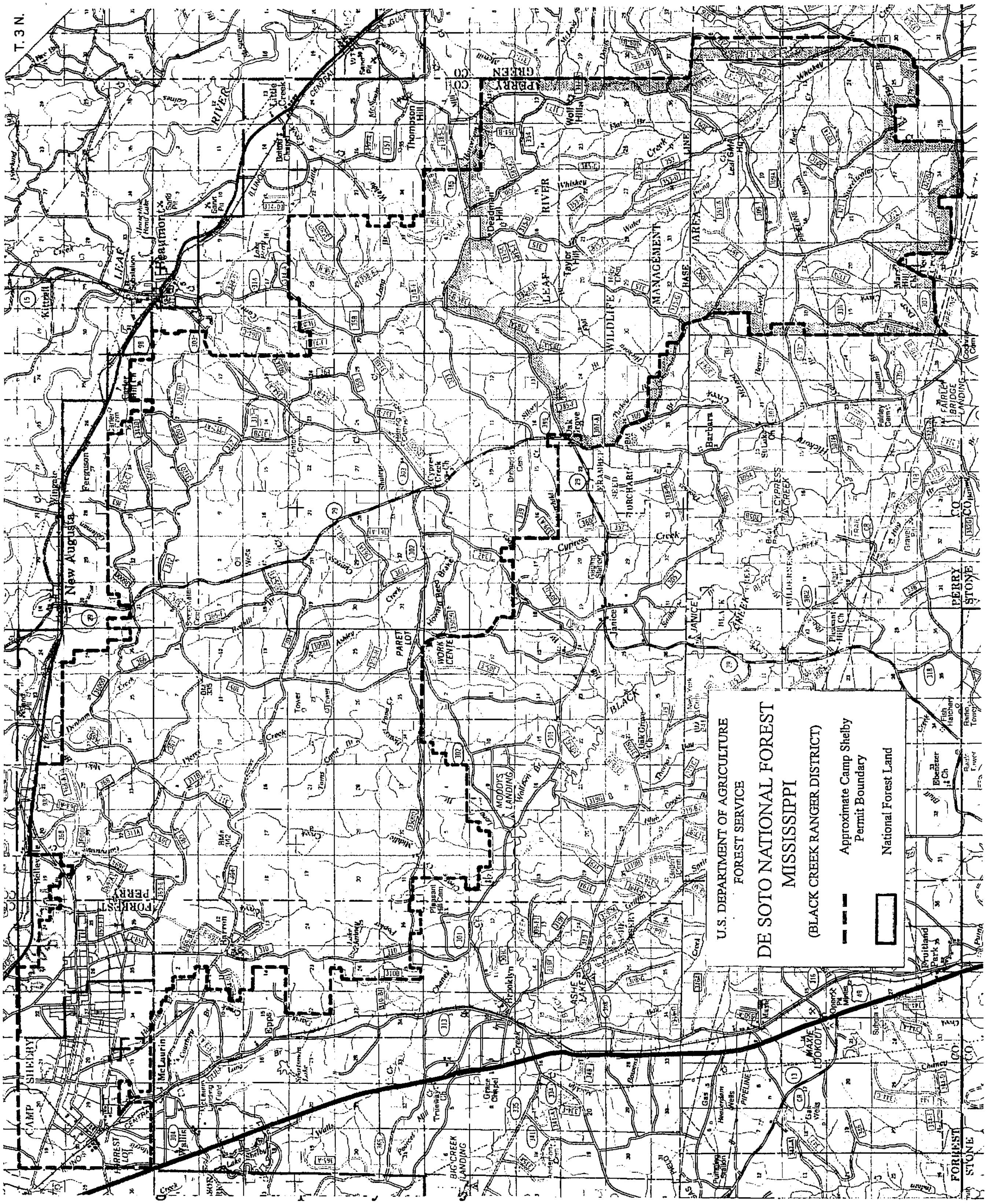

Figure 1-3 Camp Shelby and Adjacent National Forest Lands

1.1.2 Need for the Action

1.1.2.1 Military Requirements

The U.S. Army's basic fighting doctrine, called AirLand Battle, was most recently utilized in Operation Desert Storm. The doctrine is based on securing or retaining the initiative and exercising it aggressively to accomplish the mission. It implies an offensive spirit and the use of maneuver in the conduct of all operations (Department of the Army, FM 100-5, Operations, June 1993). This is a sharp departure from previous doctrine which stressed a defensive posture. This means the Army must prepare its units to fight outnumbered to win the first battle. The use of effective combined arms teams, including both tracked vehicles and aircraft, are essential to this effort.

Three armored brigades train annually at Camp Shelby. A brigade consists of three or more battalions. To be effective, this large scale training must provide an opportunity for proper maneuver, movement and occupation with distances, speed and agility that are realistic for modern equipment. In a battle situation, units would be required to communicate and maneuver over extended distances. Realistic training must ensure adequate distances so that forces can develop the required communications and maneuver skills.

Opposed forces training should be conducted at the battalion task force (opposing battalions) or company team (opposing companies) level. With the current configuration at Camp Shelby, it is not possible to conduct realistic platoon, company, or battalion task force training.

The battalion task force is the lowest echelon at which all elements of the combined arms team come together. Commanders plan artillery fire support, tactical air support, attack helicopter support, air defense deployment and defenses against electronic and chemical warfare at the battalion task force level. Chemical warfare activities at Camp Shelby are simulations of defensive procedures only. No actual chemical agents are used.

AirLand Battle Doctrine requires a larger, more rapidly moving force in order to survive, outnumbered, on a battlefield. Heavier and faster vehicles, longer engagement distances, more complex units and weapons systems, and the requirement for higher levels of combat readiness have increased the amount of land needed for effective training of a combat maneuver brigade.

For such training, a consolidated area is needed which has good trafficability, accessibility, and intervisibility. According to Training Circular (TC) 25-1, for example, the task *Movement to Contact for a Tank Battalion* can require up to 61,281 acres of contiguous maneuver area (Department of the Army, Training Circular 25-1, Training Land, 30 September 1991). Camp Shelby presently has 22,600 acres of non-contiguous tracked vehicle maneuver area, and if the Consolidated Tank Maneuver Area (CTMA) approved in 1983 were

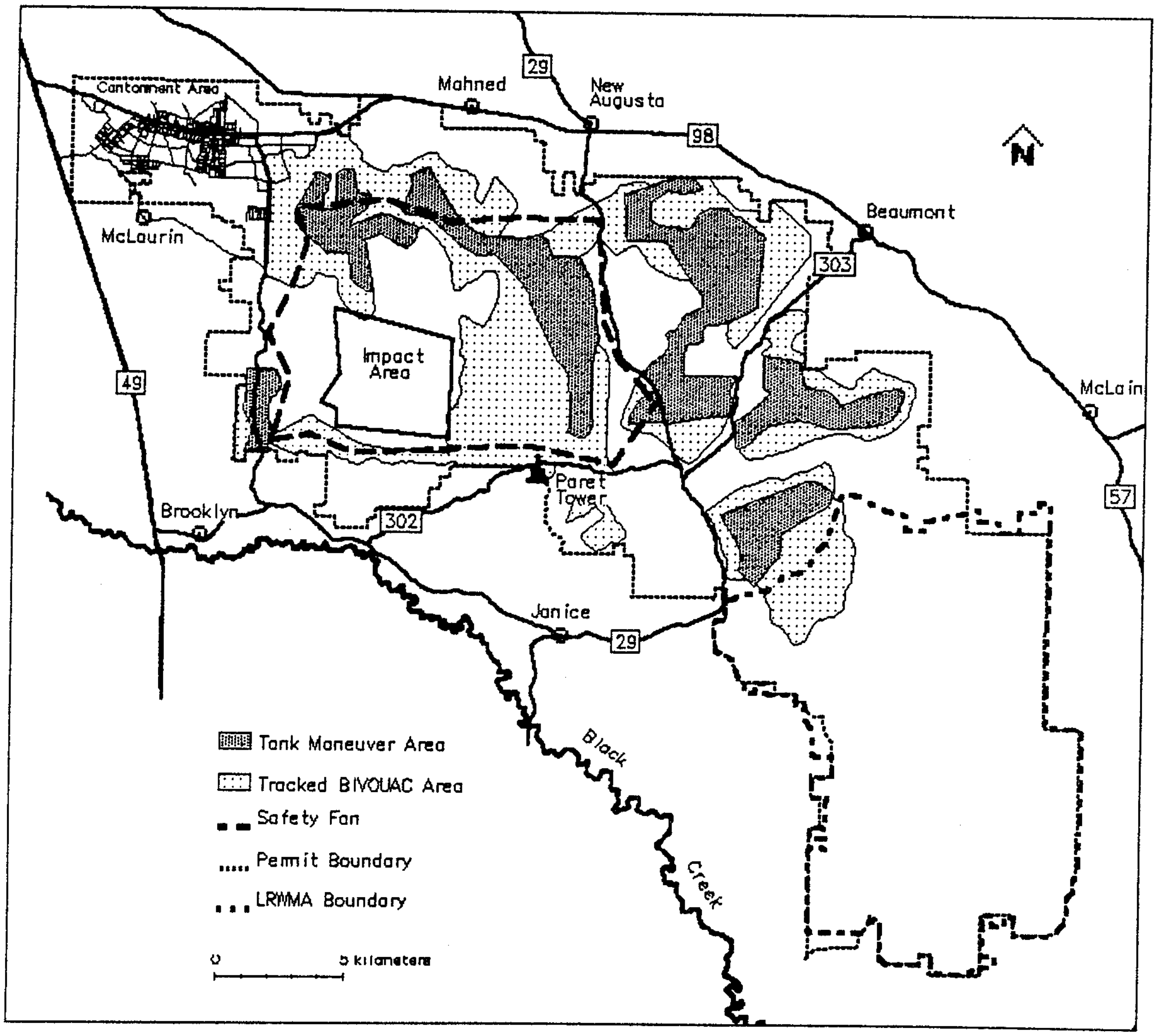

Figure 1-4 Tracked Vehicle Training Areas at Camp Shelby

Note: Tracked vehicle training areas outside tank maneuver areas are used for bivouac for APCs and Bradleys.

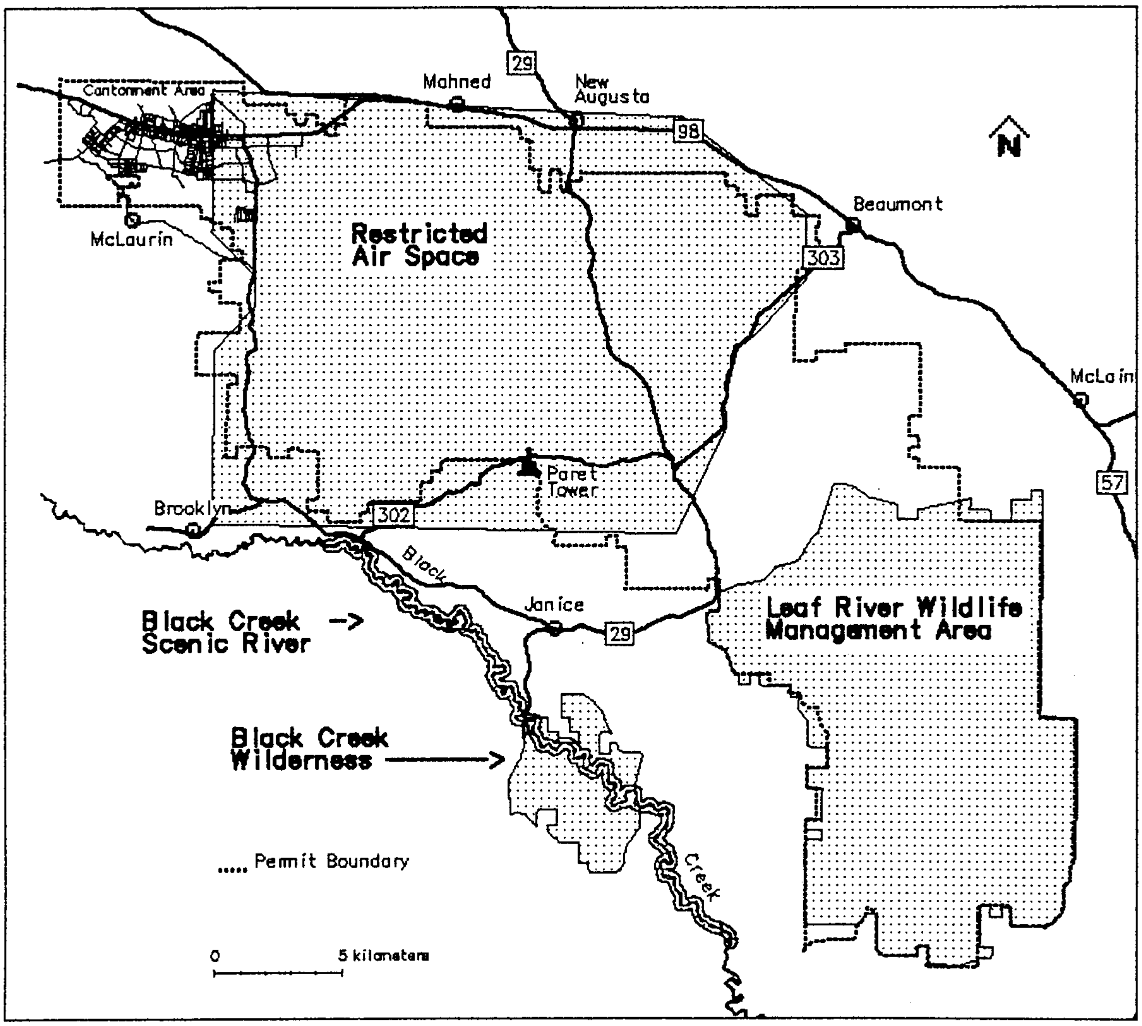

Figure 1-5 Other Land Use at and Adjacent to Camp Shelby

to be implemented, the available area would be reduced to 15,100 acres, though consolidated in a contiguous tracked vehicle maneuver area. This figure is further reduced whensimultaneous tank gunnery is occurring because of the required range safety fans. Since the inception of the CTMA concept, both tank gunnery and maneuver requirements have increased significantly, thereby decreasing the number of days that all maneuver areas are available.

The initial Land Use Requirements Study (LURS) document was a part of the MSARNG Future Plan published in June, 1988. This document was based on data input and calculations used from the Army Training Land Analysis Model (ATLAM), TC 25-1, TC 25-2 Unit Army Training and Evaluation Program (ARTEP) tasks, and Weatherford McDade's 1986 Draft EIS. The format used, the procedures for determining estimates, the requirements, etc. are the same as those used in writing the Mississippi Army National Guard (MSARNG) LURS dated November 21, 1990 (Appendix K). The 1988 LURS was followed by the October 1990 LURS which identified a shortfall of 49,146 acres of tracked vehicle maneuver area. The most recent LURS identified a shortfall of 55,581 acres of contiguous maneuver area (see Appendix K). This LURS was used to assess the training land requirements for units training at Camp Shelby.

Under the current maneuver area constraints, as indicated by the LURS, the three armored brigades are forced to train at company and platoon level rather than at the battalion level. However, the potential for brigade level training capability is available within the overall boundaries of Camp Shelby. Consultation with the three Armored Brigades reveals that the proposed land area will allow them to train to standard at battalion level on their required tasks.

The current maneuver area constraints force the three Armored Brigades to train in maneuver areas designed for platoon level training. These current platoon level training areas are unsatisfactory because of new armored training doctrine, and the capabilities of the new battle tank. The ability to provide maneuver areas in the form of maneuver corridors, which extend through an area 10 by 26 kilometers, would allow the development of those command and control situations necessary to train at battalion task force level. The internal maneuver areas also allow the commander to train individual platoons of one battalion outside the firing safety fans while gunnery training for the other battalions is being conducted.

1.1.2.2 Administrative Requirements

In 1985, the Mississippi Chapter of the Sierra Club submitted a notice of appeal and statement of reasons regarding the National Forests in Mississippi Land and Resource Management Plan (U.S. Department of Agriculture, Forest Service, Letter to Mississippi Chapter, Sierra Club (1570(PPB)), dated 10 November 1986). The lone appeal issue which had not been resolved was a question of the appropriateness of the special-use of a portion of the forest for military training. The U.S. Forest Service agreed with the appellants' statement that "the best way to insure that military uses do not cause excessive resource damage and do not conflict with preservation of endangered species of plants and animals and recreational

use, is to require that detailed environmental studies be conducted prior to modification of ... military activity levels." The Forest Service noted that they "believe expansion or change of military use requires NEPA analysis and documentation with the opportunity to appeal any resultant decisions." (U.S. Department of Agriculture, Forest Service, [Letter to Mississippi Chapter, Sierra Club (1570(PPB)), dated 10 November 1986 (page 3)] The present EIS is in keeping with the spirit of that letter.

1.1.2.3 National Military Goals

As announced in December 1993, the proposed mission of the Army National Guard will focus, in the future, on two roles: a wartime combat mission and a domestic emergency mission (Aspin, 1993). This is in some contrast to the variety of past roles and accompanying force structure, in which the Guard more or less mirrored all active Army functions. In this new organizational structure, the Army Reserve will assume the major responsibility for combat service support missions. Some Army Reserve units whose role is combat arms will transfer to the National Guard, while others will be disestablished as part of the general downsizing of the forces. The Guard is proposed to gain artillery, aviation, mechanized infantry, and armor units, among others. This is in distinct contrast to earlier suggestions that the guard role would focus on support missions and lose its heavy combat arms role.

The Army National Guard (ARNG) force structure for the future, as directed by the Army, will include increased numbers of Armor units equipped with the Main Battle Tanks (M-1 series), Bradley Fighting Vehicles (M2/M3) and Armored Personnel Carriers in the M113 series. The ARNG will also receive increased numbers of tracked field artillery pieces as well as other combat and tracked vehicles. The Mississippi, Alabama, and Tennessee ARNG units train their armor forces at Camp Shelby. If Camp Shelby is not available, other active Army installations would be unable to support the training needs of the ARNG units now training at Camp Shelby. The requirement to provide facilities on training weekends and during the (summer) Annual Training period would exceed the capability of available active Army installations.

The Camp Shelby Training Site (CSTS) is a major training site and mobilization station for designated Reserve Component (RC) units. It is clearly more efficient to store and maintain heavy equipment such as tanks, artillery, and other vehicles for RC units at the location where mobilization will occur. It is also critical that the RC unit soldiers train with and maintain their own equipment. Camp Shelby has served as a mobilization station and training site for units that were involved in World War I, World War II, Vietnam and Operation Desert Storm. Camp Shelby has been designated by U.S. Forces Command[1] (FORSCOM) as a mobilization station. Other active Army installations do not have the capacity to support mobilization of these designated RC forces in addition to their current mobilization population.

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[1] The U.S. Army Forces Command is the command responsible for CONUS-based, trained units available for combat duty. This is opposed to the Training and Doctrine Command (TRADOC) which trains personnel in individual skills.

The use of Camp Shelby as a regional training site is vital in order to minimize travel time for ARNG soldiers whose units are located in the region. The regional location, coupled with the capability to support training for heavy Army forces, makes Camp Shelby a high-priority resource for the ARNG training mission. The Air National Guard also makes use of the Camp Shelby firing ranges for bombing and gunnery practice for Air Guard aircraft from several states.

1.1.3 Previous Special Use Permits

The U.S. Department of Agriculture is the primary landowner at Camp Shelby. The Mississippi Army National Guard (MSARNG) operates Camp Shelby through Special Use Permit (SUP) with permit compliance coordinated by the U.S. Forest Service (USFS). Some form of permit or Memorandum of Understanding (MOU) has been in effect since World War II.

A SUP issued January 12, 1949, covered the small arms range of 4,820 acres. On August 5, 1952, 1,960 acres for railroad and other improvements were granted by SUP. A permit granted May 6, 1954 covered 9,760 acres for air-to-ground gunnery and bombing range, and the SUP of May 7, 1956 covered the old impact area and miscellaneous ranges on 13,000 acres, renewable on a year-to-year basis. Approximately 6,800 acres were included in the May 6, 1954 permit. Use of an additional 40.03 acres Public Domain land was also granted by SUP on September 9, 1957 and 34.76 acres withdrawn from Public Domain by Public Land Order. In 1965, an additional 38,859 acres were included in a SUP for a tank maneuver area.

On February 18, 1966, all Special Use Permits were consolidated into a Memorandum of Understanding between the USFS and Mississippi National Guard. This was agreed upon as an instrument to govern overall training and tank maneuver use of 58,735 acres of National Forest lands by the National Guard. Amendment 1 on June 23, 1966 added 52 acres for a river crossing site. On March 15, 1967, Amendment 2 added 58,898 acres for maneuver, excluding tanks and similar vehicles. Amendment 3 signed January 2, 1968 revised Amendment 2 with a change to 58,474 acres designated for tank and tracked vehicle training. This increased the original acreage from 116,000 to 117,261 acres, and identified "Off Limits Areas" as well.

Thus, from 1968 to June 30, 1972, tracked vehicle maneuvers were permitted throughout the area covered by the MOU. Some members of the public expressed concern over lack of control over these activities and alleged that excessive environmental damage resulted. Subsequently, specific areas were designated for tracked vehicle maneuvers. These were selected areas where timber thinning was necessary, and would allow for tank maneuver and sufficient timber production as well. All permits since 1973 have continued this concept in an effort to ensure that activities are located to minimize environmental disruption.

On June 30, 1972, a SUP was issued for 113,769 acres and the MOU was terminated. Amendment 1 issued November 3, 1973 increased the acreage to 115,689. This permit was updated and reissued on January 5, 1979 for 116,199 acres. It was reissued again on August 20, 1984 for 116,639 acres. This permit, with amendments, is the current authorization for military use of National Forest lands at Camp Shelby.

In 1985, an Environmental Assessment was prepared for a Consolidated Tank Maneuver Area (CTMA) of approximately 13,893 acres. The analysis found that the CTMA would have no significant environmental impact. A decision was made to proceed with the implementation of a CTMA which would replace a total of 20,248 acres in several existing locations. A total of 13,893 acres were to be assembled for a CTMA but the proposal was never fully implemented because subsequent changes in DOD military doctrine (see Section 1.1.2) placed reliance on brigade and battalion level training, making the CTMA concept outdated. The reason for not implementing the proposal was that the land in question was never cleared for tracked vehicle training. In addition, modernization of the National Guard with acquisition of the M-1 Tank and the Bradley Fighting Vehicle, as well as initiation of the M60A3 Tank program at Camp Shelby, also led to the decision not to fully implement the CTMA.

In 1986, an amendment was made to the existing SUP to allow "year-round firing" by the M-1 and M60A3 tanks and the Bradley Fighting Vehicle. The area involved a total of approximately 30,000 acres, including firing ranges and the impact area. When tank gunnery was required, about 16,000 acres potentially available for public use were closed to entry for safety purposes. Such closures were typically for two or three days at a time, and could have occurred in almost any month of the year. Based on an Environmental Assessment (EA) prepared by the Corps of Engineers, no significant impact was found that resulted from the action. In practice, such closures are avoided on those weekends which are major times of hunting pressure.

At the end of 1988, the SUP covering the portion of training area that is on National Forest land expired, and was renewed for one year to allow for completion of the EIS covering current activity with some expansion. This extension was granted with the modification of a clause that full NEPA analysis (i.e., the present Environmental Impact Statement) be required for activities or improvements. At the end of each year from 1989 to the present, the SUP has again been extended one year at a time to allow completion of this EIS (see Appendix A).

1.1.4 Proposed Piñon Canyon Land Exchange

Several portions of the Army's Piñon Canyon Maneuver Site (PCMS), near Trinidad, Colorado were found to contain archaeological and paleontological sites. These parcels were originally proposed to be transferred to the National Forest System in exchange for transfer of ownership of a portion of the Camp Shelby permit area which lies within the De Soto National Forest. The Notice of Intent (NOI) to prepare an EIS for such an action was published in the *Federal Register* on January 4, 1990, and public scoping meetings were held

at three locations in Mississippi in January 1990 (U.S. Govt. Printing Office, *Federal Register*, Vol. 55, No. 3, p. 351, 4 January 1990). See Section 1.1.7, and Appendix P.

At least five potential variations were suggested at that time for examination as alternatives. First, that 16,000 acres of the PCMS be exchanged for 32,000 acres now within the southeast portion of the Camp Shelby Training Area, and that the Special Use Permit (SUP) on the remaining acreage be renewed. Second, that 16,000 acres of the PCMS be exchanged for 16,000 acres now within the northeast portion of the Camp Shelby Training Area, and that the SUP on the remaining acreage be renewed. Third, that 16,000 acres of the PCMS be transferred to the National Forest System, that no land be transferred in fee and that the SUP on the entire existing acreage be renewed. Fourth, that 16,000 acres of the PCMS be transferred to the National Forest System, that no land be transferred in fee and that the SUP on the entire existing acreage not be renewed. Fifth, that no land in the PCMS be transferred to the National Forest System, that no land at Camp Shelby be transferred in fee and that the SUP on the entire existing acreage not be renewed.

Subsequent to the initiation of the present EIS, Congress passed legislation mandating the transfer of the PCMS land to the National Forest System [Public Law 101-510 (Section 2585, 1991 DOD Authorization Act) 5 November 1990].

A memorandum from the Assistant Chief of Engineers, Department of the Army, stated that the expansion of maneuver training at Camp Shelby for National Guard training and transfer of Piñon Canyon lands to the National Forest System were to be considered two separate actions which would be managed separately (Peter J. Offringa. Memorandum for Chief, National Guard Bureau, dated 15 January 1991). The Office of the Assistant Secretary of the Army for Installations, Logistics, and Environment (OASA-IL&E) made the decision to proceed with this EIS on the continued and reconfigured training use of certain lands within the De Soto National Forest, even though land exchange was no longer an issue.

1.1.5 Training Facilities EIS

An Environmental Impact Statement was prepared in the 1988-1990 time frame by Weatherford McDade, Ltd., for the proposed implementation of 28 individual actions that update existing training facilities or provide additional ones at the Camp Shelby Annual Training site (U.S. Govt. Printing Office, Federal Register, Vol. 56, No. 31, 14 February 1991). It is referred to in this EIS as the *Training Facilities EIS*. In that study, four alternatives were evaluated for each of the proposed actions. These alternatives included 1) maintenance of current training capabilities without the benefit of the proposed facilities (no action), 2) utilization of training facilities at another military installation, 3) implementation of facilities at an alternative site at Camp Shelby, and 4) implementation of facilities at the preferred locations. Of the alternatives identified as feasible, an environmental impact analysis was performed, to identify potential impacts, based on 11 environmental attributes. The cumulative effect of implementing all of the proposed facilities was addressed. No significant environmental impact was identified as a result of implementation of all the

proposed facilities or with implementation of any of the individual facilities. A National Guard Bureau/Mississippi National Guard Record of Decision was prepared on 24 May 1991 (Appendix B). The U.S Forest Service decision on the facilities to be constructed within the operational area (National Forest administered lands) was deferred. The decision on these facilities will be included with the U.S. Forest Service ROD for the issuance of the SUP.

The Training Facilities Final EIS proposed the construction of 14 facilities in the Cantonment Area and 5 facilities in the Operational Area. These facilities are included in the ROD in Appendix B, and are presented in summary in Sections 1.1.5.1 and 1.1.5.2. It is assumed that some or all of these facilities will ultimately be constructed if Camp Shelby remains open. Therefore, all alternatives in this EIS which continue military field training activities at Camp Shelby would include these training facilities (see Section 1.2). The analysis of the environmental effects of constructing these facilities in the Training Facilities EIS is incorporated by reference into the present document, as is the discussion of training activities and firing range usage and resulting effects. The Executive Summary of the Training Facilities EIS, which includes a summary of the possible environmental consequences, is included in Appendix B of this EIS. The Multi-Purpose Range Complex - Heavy and the Tactical Aviation Areas (both described in Section 1.3) were removed from the Training Facilities Final EIS, with the understanding that they would be further evaluated in the present study.

1.1.5.1 Cantonment Area Facilities

The 14 facilities designated in the Training Facilities Final EIS and its Record of Decision are listed below. They are proposed to be located within the Cantonment Area or the Close-In Training Area adjacent to the Cantonment Area. Their locations are shown (by number) on the map in Figure 1-6. Descriptions and proposed locations are as presented in the Training Facilities Final EIS.

- Regional NCO School MMA Complex (1)
  Description: The facility consists of classrooms, barracks, supply and dining facilities required for a non-commissioned officer instructional institution and for the Mississippi Military Academy. This is a 12-building complex and covers approximately 4.5 acres.
  Location: The site is proposed within the Cantonment Area between blocks 3400 and 3600 where 35th Street crosses Lee Avenue.

- Enemy Prisoner of War (EPW) Camp
  Description: The camp will include barracks, administration building, guard towers, double fences and a sally port entrance. The project is proposed for fiscal year 1995 and will cover approximately 5 acres.
  Location: The facility's proposed location is in the Close-In Training Area, south of Forrest Avenue between 40th and 42nd Streets and 6th and 8th Avenues.

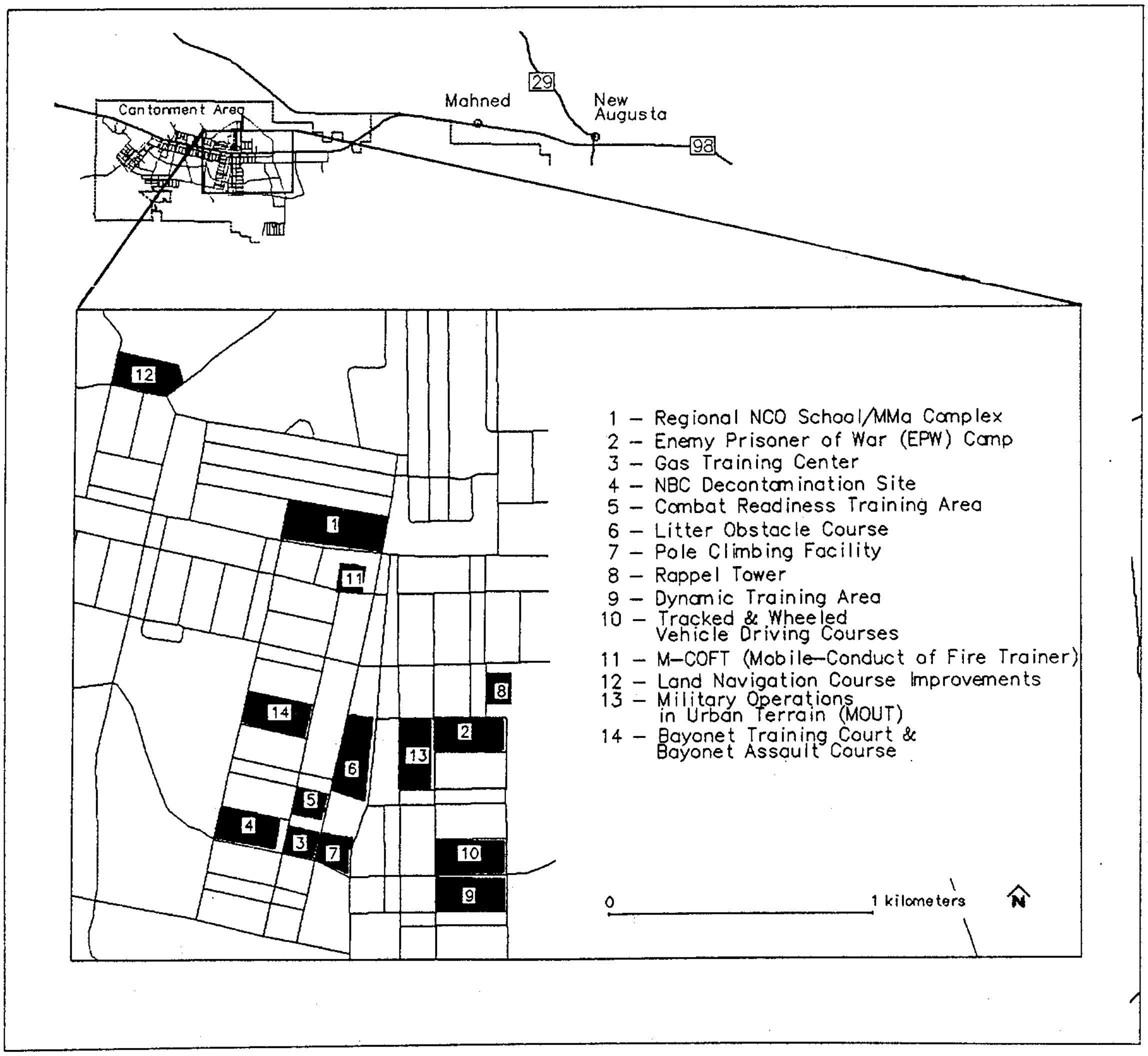

Figure 1-6 Location of Cantonment and Close In Training Areas (CITA) Training Facilities

- Gas Training Chamber
  Description: The entire area serving the gas chamber occupies one (1) acre. It consists of a single concrete building for the chamber, parking area, walks and assembly area.
  Location: The facility will be located at the intersection of 11th Avenue and 36th Street.

- NBC Decontamination Site
  Description: The site covers four (4) acres. It consists of a gravel loop road with various points for performing decontamination, rinsing, drying and checking for safe status.
  Location: The proposed location is between 10th and 11th Avenues and west of 35th Street.

- Combat Readiness Training Area
  Description: The facility consists of structural elements used to develop skills in negotiating adverse physical environments.
  Location: The training area will be located between 36th and 37th Streets and between 9th and 11th Avenues.

- Litter Obstacle Course
  Description: This area covers approximately 1.5 acres. It consists of an obstacle course including walls, slopes, barbed wire and others.
  Location: Inside Close-In Training Area between 37th and 38th Streets north of 8th Avenue.

- Pole Climbing Facility
  Description: The facility consists of 10-15 utility poles and covers 1.5 acres.
  Location: Between 37th and 38th Streets north of 11th Avenue.

- Rappel Tower
  Description: The tower is a wooden structure occupying approximately 1 acre.
  Location: In the CITA east of 39th Street and north of 6th Avenue.

- Dynamic Training Area
  Description: The structural facility includes a rappeling tower, slide for life, log walk and jump tower. There is a parking area and access road with gravel surfacing, a small valley used for water impounding and a dam. The entire facility covers 6 acres.
  Location: Is located on the edge of a 2-3 acre (surface area) lake with a 15-20 foot depth. The area is set on the southeast corner of 41st Street and 11th Avenue.

- Tracked and Wheeled Vehicle Driving Courses
  Description: This project is proposed for construction in fiscal year 1997. It will include ditches, log cribs, grades etc., to be used as obstacles. Total area amounts to 8 acres.
  Location: The proposed location is between 11th Avenue and 42nd Street.

- M-COFT (Mobile-Conduct of Fire Trainer)
  Description: This is an 8 foot by 35 foot trailer housing a simulator device. The simulator is used to train tank crews.
  Location: The trailer will be located in a parking lot on Jackson Avenue.

- Land Navigation Course Improvements
  Description: Improvements consist of a 20 foot by 40 foot concrete slab, parking area, storage room and instruction bleachers.
  Location: The area expands the existing forested training area north and east of the Cantonment Area.

- Military Operations in Urban Terrain (MOUT)
  Description: This is a simulation of a European village with a series of one- or two-story buildings (shells), streets and mock sewer systems.
  Location: The village will be located in the Close-In Training Area between 38th and 40th Streets and between 6th and 9th Avenues.

- Bayonet Training Court and Bayonet Assault Course
  Description: This is a wooded site with 20-23 obstacles made of concrete blocks, wood and earth forms.
  Location: At the intersection of 11th Avenue and 36th Street.

1.1.5.2 Operational Area Facilities

The following projects (Figure 1-7) were described in the Training Facilities Final EIS (1991) as proposed to be located in the Operational Area. Roughly speaking, this refers to the area included within the SUP proposed to be issued by the Forest Service. These facilities are proposed to be constructed in association with all "action" Alternatives (1, 2, 3A, 3B, 4, 5).

- East Range Road
  Description: A connecting road 24 feet wide accommodating two-way traffic. The road is separated from Highway 29 by a 200 foot vegetative buffer.
  Location: Parallel to Highway 29; there are two bridges, one on Cypress Creek and one on Shuteye Creek.

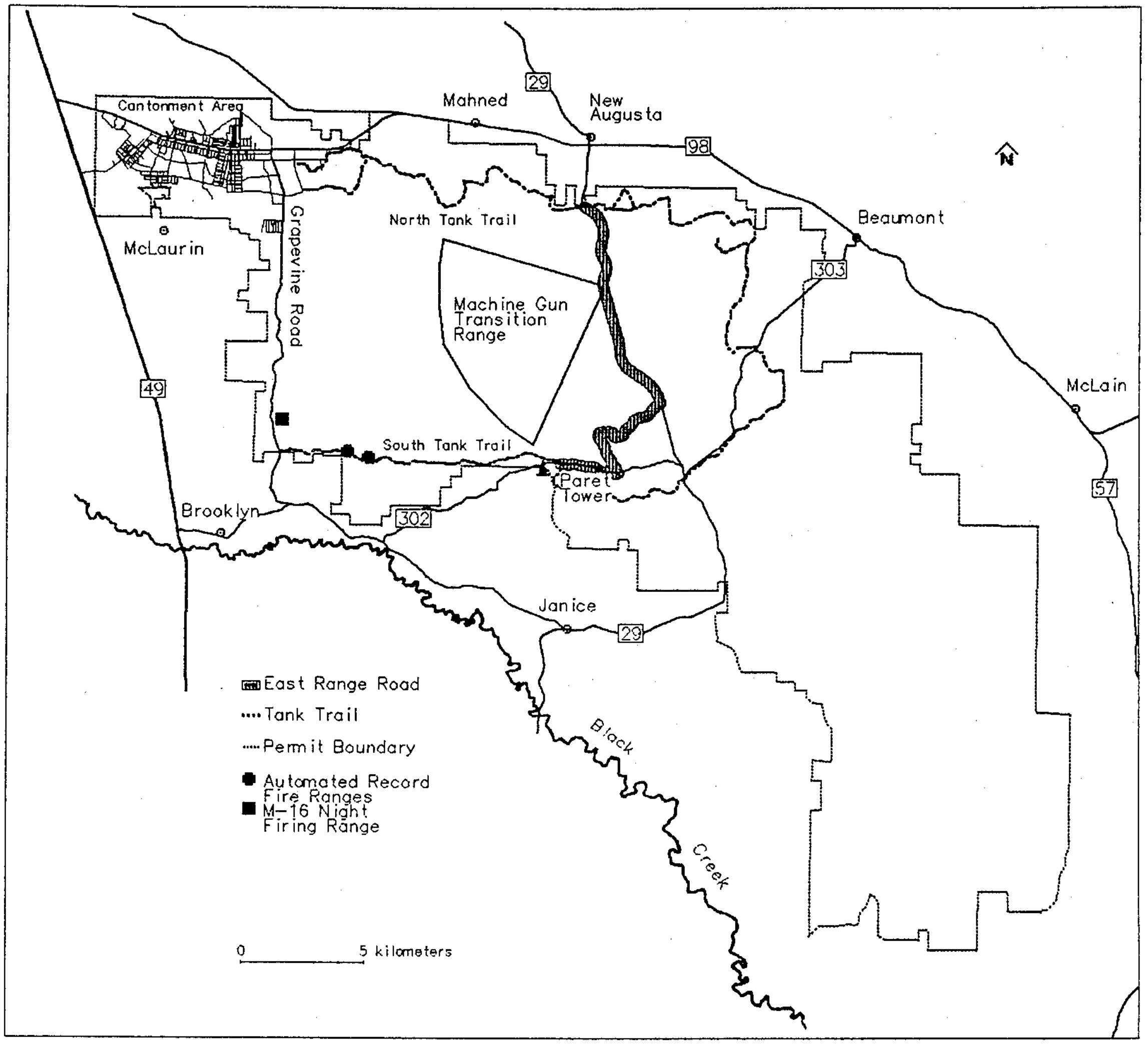

Figure 1-7 Training Facilities Within the Operational Area

- Automated Record Fire Ranges
  Description: Structures include grading, a salvage wall, control tower, mess shelter and latrines. The ranges display computer-driven targets from 50 to 300 meters.
  Location Southwest of the common impact area with access available from the South Tank Trail. One to be located on existing Range 48; the second to be located on proposed Range 49 as depicted on current military maps.

- M-16 Night Firing Range
  Description: Construction involves upgrading of the existing range. Structures include grading, clearing of vegetation, salvage wall, low level red lighting and a control tower.
  Location: West of the common impact area with access to Grapevine Road.

- Machine Gun Transition Range
  Description: Clearing of approximately 100 acres. Structures include grading, firing points, firing lanes, parking areas, access roads, salvage wall and target arrays.
  Location: West of Highway 29, just south of the North Tank Trail.

1.1.6 Use of GRASS in Definition and Comparison of Alternatives

The Geographic Resources Analysis Support System (GRASS) is a computer-based geographic information system (GIS) developed by U.S. Army Construction Engineering Research Laboratory (USACERL) for use in planning and managing military installation resources. It is designed to operate on a variety of relatively inexpensive workstations, or "supermicrocomputers," which use the UNIX operating system. The GRASS software package(s), prior to the initiation of the present study, have been applied to many Army installations, regional planning databases and county soil conservation applications.

Normal data input into GRASS is from maps or imagery, either photographic or satellite-based. Though the images have sufficient data to provide the eye with a picture that looks realistic, this information content can be further interpreted to develop land cover classifications, which group areas that have similar spectral properties into land cover types.

The resulting classified[2] and georeferenced image becomes part of an area's database, to be later combined with elevation, slope, ownership, geology, and other maps by the user. This combination of one set of data with others is what provides GRASS, and other GIS systems, the capability to "analyze" information for a variety of purposes. One may, for example, request the display of all cells where an identified habitat of an endangered species is within one cell (in the Camp Shelby database, 20 meters, or about 66 feet square) of a feature, such as a road or boundary. The resulting "reclassified" data may be further compared with still more environmentally significant elements, such as groundwater resources, archeological sites,

[2] The term "classified," as used here means "separated into similar categories," and has no relationship to national security.

specific soil (or bottom sediment) types, and the ranges of other species. This technique is philosophically identical to the "overlay" technique used in regional planning, where transparent overlays containing several different problems may be compared visually.

Figure 1-8 is a GRASS map, equivalent to a transparent overlay, of Camp Shelby which was produced by adding the erosion potential map to the revegetation potential map. The higher the number, the higher the risk of erosion and the lower the potential for revegetation. The erosion risk map was produced as a weighted map from soil K-value, slope, distance from streams, and wetlands, location within a buffer around the streams and wetlands, and the ability of the soils to support vehicles. The revegetation potential map was produced by reclassifying the soils as follows to reflect this capability.

The resulting "Erosion/Revegetation Potential" map (Figure 1-8) was derived in a series of steps with numerous inputs. It is the result of combining: 1) the SCS or soil capability classes (in the layer soils.cap) which were derived from the reclassification of the basic SCS soil series map of the area. This reclassification reflects the innate character of the soils to resist erosion, per the classifications developed by the SCS; 2) slope (in percent) (from the layer shel.w1) which describes the influence of the speed of flow of the water over the soil surface. The greater the slope, the greater the speed with which the water will move and therefore it will have an increased ability to carry soil particles and cause erosion; 3) Streams and wetlands are considered highly sensitive areas and are therefore dealt with as unique areas in the analysis; 4) the areas in the nearby surrounding areas (the streams and wetlands buffers) are also considered to be of a higher sensitivity and are set aside as unique in this analysis; 5) sensitivity to vehicular traffic. This is also a reclassification derived from the underlying SCS soil series map of the area. It is based on analysis of information originally presented in the SCS engineering characteristics tables for development of unpaved roads.

This overall rating thus estimated the ease with which vegetation can be re-established on a particular soil, and the level of management required to establish, and maintain vegetation. These maps were then added together to produce a combined erosion risk-revegetation rating number. This abstract number, presented here with values between 1 and 12, is a guide to the level of risk and management effort required to maintain an area, and is not intended to show the amount of either erosion on a particular site, or the management required to revegetate it. In the siting of facilities and training areas, tracts which had above average erosion potential and below average revegetation potential were avoided. Thus, GRASS output was utilized to identify environmental constraints.

A specific additional use of GRASS was in the estimation of soil erosion and sedimentation effects of present conditions, present mitigation plans, proposed alternatives and proposed mitigation alternatives. In these analyses, Camp Shelby terrain, soils and climatic location were used. Additional maps were developed containing land use cover scenarios consistent with planned training and management patterns under each alternative and present conditions. Throughout, attempts were made to use concepts and techniques compatible with Forest Service erosion and sedimentation techniques, so results of simulations could be compared

with confidence to current land uses. Briefly, this analysis uses a modification of the RUSLE or Revised Universal Soil Loss Equation (Renard et al., 1992) to include slope length and steepness effects on surface flow characteristics. These techniques use detailed terrain information available from GRASS and provide much more detailed information on erosion and sedimentation. Additional description of the erosion and sedimentation estimation techniques were provided by Mitasova et al. (1993).

1.1.7 Public Involvement

1.1.7.1 Scoping

As part of the process to develop the content and coverage of this EIS, a series of four "scoping[3]" meetings were held in January 1990, during the period set aside for public input. Three scoping sessions were held in Mississippi and one was held in Colorado. A summary of the scoping process is provided in Appendix P. Written comments received during this period included many letters which only expressed support for the proposed interchange but offer no specific comments and several letters which expressed opposition to the interchange but offer no additional comments.

There was substantial public involvement during this period from participants in the public scoping sessions and in written form. Over 660 individuals participated at the scoping sessions with 129 providing oral and written comments. These comments were condensed and grouped into eighteen areas and are provided in Appendix P.

In January 1991, the proposed interchange of land between the Department of the Army (DA) and the Department of Agriculture was removed from consideration as a proposed Federal action. Therefore, those public scoping comments which pertained only to the interchange of land were dropped from further consideration. Of the 233 condensed comment or issue areas identified during scoping, 72 dealt with the interchange only and 39 dealt with the interchange in part. The 72 comments/issues dealing with the interchange were dropped from further consideration, while those comments which dealt with the interchange in part were retained, though only issues expressed other than land interchange were evaluated.

There were 34 comments/issues which were expressed by 5 or more individuals. These issues, along with a brief description of the comment or concern, are presented in Table 1-1.

Several of these comments led to the development of additional alternatives evaluated in this EIS. For example, the alternative to conduct tracked vehicle maneuvering in an area north and west of U.S. Forest Service Road 303 is one which comes directly from the scoping process (see Section 1.2.3).

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[3] The term "scoping" was developed to describe the process whereby an agency solicits information and opinions from regulatory agencies and the public about the most important topics to be evaluated, i.e. the scope, of a proposed EIS (40 CFR §1501.7).

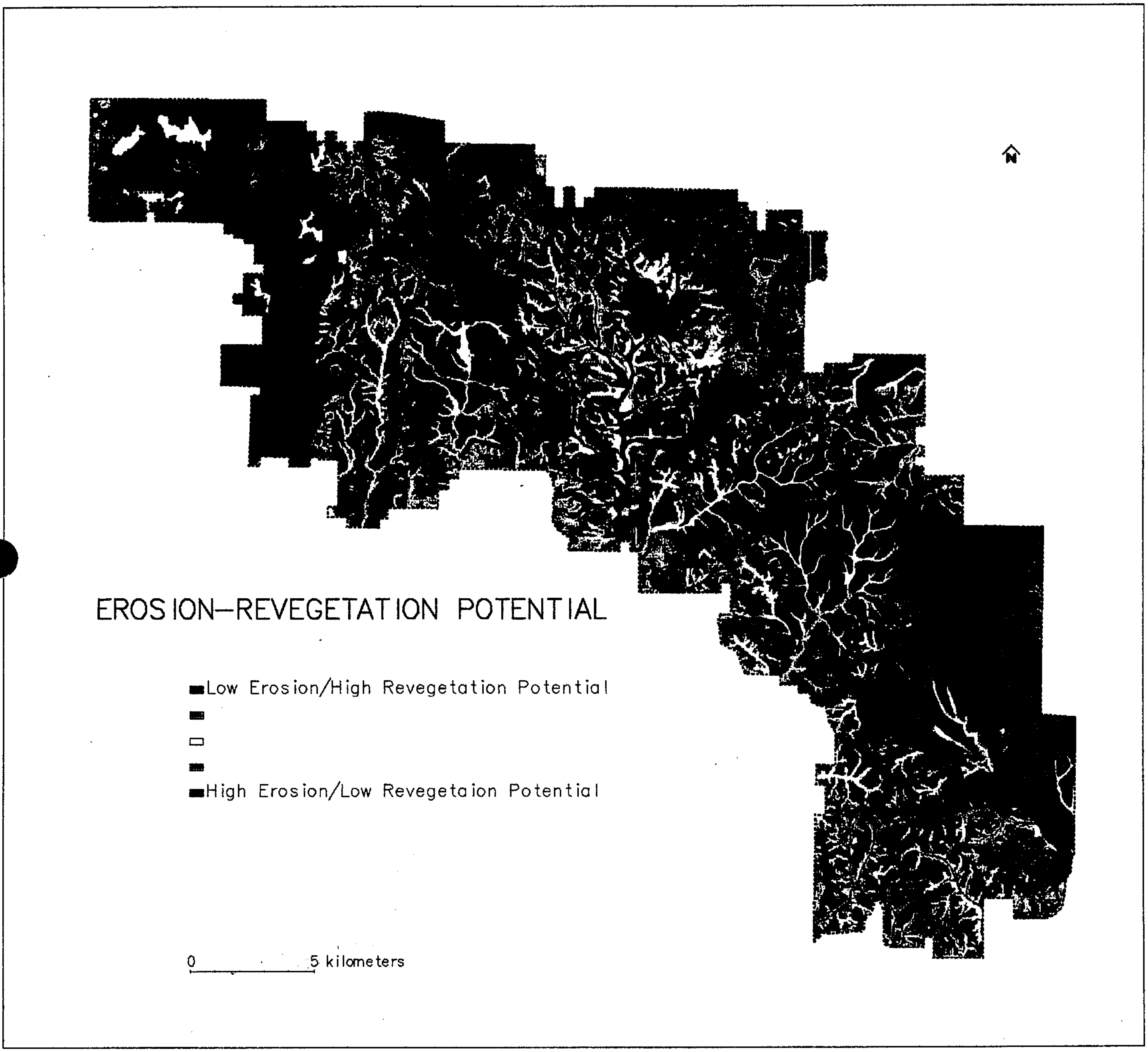


Figure 1-8 GRASS Erosion and Revegetation Potential Map, Camp Shelby

Several comments dealt with monitoring the effects of military activities at Camp Shelby. These concerns are proposed to be addressed by the implementation of the Integrated Training Area Management (ITAM) program which was initiated at Camp Shelby in 1990. The ITAM program is discussed in more detail elsewhere in this EIS (see Section 3.4.1 and Appendix G).

Requests for threatened and endangered species surveys were incorporated. All of the designated suitable habitat for the red cockaded woodpecker was surveyed for presence of the species and information on this survey is presented in the EIS (Appendix N). Surveys were also conducted for the gopher tortoise and eastern indigo snake on areas proposed for use and which had not been surveyed previously (Appendix L).

The use of the geographic information system, GRASS, was incorporated into the analyses of alternatives and provided information used in analyses of effects of the proposed action on various resources (see Section 1.1.6). The data base on which these analyses for Camp Shelby were based included information from various federal and state agencies including the Department of Army, Mississippi Army National Guard, U.S. Forest Service, and U.S. Fish and Wildlife Service. The use of this system addressed those comments or concerns that requested delineation of resources such as wetlands, streams, threatened and endangered species, and timber stand information.

A recreation usage survey was initiated to respond to comments and issues on recreation resources (Appendix F). The survey addressed both hunting and non-hunting use of the Camp Shelby area.

The need for military training and training requirements issues have been incorporated into the EIS to address questions or issues raised during scoping (see Section 1.1.2).

Appendix 10-12 of the Training Facilities Final EIS (Weatherford McDade, 1991) contains public comments and responses to that Draft EIS. In addition to the formal scoping conducted for the present EIS, concerns expressed in Appendix 10-12 were utilized as another expression of public input.

1.1.7.2 Public Review of Draft EIS

The Draft EIS was mailed out for comment to 681 agencies, interested organizations, and individuals on November 21, 1991 (see Chapter 9). The notice of availability for the Draft EIS was published in the *Federal Register* (Volume 56, Number 230) on Friday, November 29, 1991. The public comment period announced in the letter transmitting the draft was from November 29, 1991, the date of official release, to January 28, 1992. At the request of several individuals, the public comment period was extended to March 1, 1992.

Table 1-1 Summary of Scoping Issues

ISSUE AREA	COMMENT/ISSUE	NUMBER OF COMMENTORS
Economics	Assess economic impacts to travel/tourism, recreation businesses, and timber industry if the interchange* proceeds and if it does not	37
Military Training	Discuss military training requirement for tracked vehicle maneuver units and other military training in the proposed interchange* area and special use permit area	29
Procedural	EIS should address natural resources and wildlife management for both proposed actions	20
Procedural	Follow NEPA procedures to evaluate proposed actions	19
Recreation	Describe the impacts to recreation (hunting and non-hunting) and to Black Creek Scenic River, Black Creek Trail, Leaf River Wildlife Management Area and in proposed interchange* area	18
Economics	Describe how lost timber revenues from proposed actions for schools and road budgets will be made up	17
Geology and Soils	Discuss the effects of soil erosion from tracked vehicle maneuvering at Camp Shelby	17
Military Training	Discuss the need for additional acreage for National Guard use	16
Economics	Discuss the economic impacts of National Guard activity at Camp Shelby to local and regional economics	14
Geology and Soils/Water Resources	Evaluate effect of construction and operation of tank maneuver areas and other activities at Camp Shelby on soil erosion into river and streams	14
Threatened and Endangered Species	Provide protection plans for threatened and endangered species in interchange* area	14
Threatened and Endangered Species	Conduct intensive surveys of TE&S species to evaluate impacts of both proposed actions	13
Noise	Discuss the effects of noise from military activity on wildlife and other resources	11
Timber	Describe, for interchange* area and rest of Camp Shelby, density of trees presently in proposed maneuver areas and density to be left, number of acres of timber to be cleared and number of acreage to be thinned	10
Recreation	Evaluate impact from all uses of proposed interchange* area on Leaf River Wildlife Management Area, Black Creek Wilderness Area, Black Creek Trail and Scenic River	9
Threatened and Endangered Species	Provide mitigation for any TE&S species affected by proposed actions	9
Timber	Evaluate cumulative effect of tree removal without regeneration on local timber industry	8
Procedural	Provide Master Agreement analysis that substantiates no other military reservations are available for maneuver training	8

(Table 1-1 con't on next page)

Table 1-1 Summary of Scoping Issues (con't)

ISSUE AREA	COMMENT/ISSUE	NUMBER OF COMMENTORS
Geology and Soils/Botanical Resources	Describe wetlands on interchange* area and best management practice to be used to provide for no net loss of wetlands and for protection of soils wet for more than 3 months (including buffer zones)	7
Procedural	Describe monitoring plan proposed for all potential impacts that could occur as a result of current and proposed activities	7
Geology & Soils	Discuss soil erosion measures at Camp Shelby	7
Cultural/Historical Resources	Conduct intensive archeological survey on Camp Shelby for Native American sites, homes older than 50 years, and family cemeteries and describe protective action to be used for all proposed actions	6
Timber	Discuss effects of tree damage from tracked vehicle maneuvering at Camp Shelby	6
Timber	Discuss DOD timber management on the proposed 39,500 acres of land to be owned by DOD	6
Timber	Discuss loss of timber production/regeneration when only mature trees are left on maneuver space in interchange* area and on the remainder of Camp Shelby	6
Noise	Discuss effects on humans of noise levels associated with Camp Shelby activities	6
Procedural	Develop an alternative to operate north and west of U.S. Forest Service Road 303	5
Wildlife	Discuss effects of land clearing at Camp Shelby on wildlife	5
Noise	Provide noise level contours and elevation of impacts based on blast noise levels at time of firing, include greatest number of blasts to occur and length of time blasts would occur in a series	5
Noise	Evaluate impact of noise levels from Camp Shelby activities on wilderness areas	5
Botanical/Wildlife	Describe laser equipment to be used, locales of use and effects it will have on flora and fauna	5
Procedural	Comply with existing environmental laws and provide oversight to ensure compliance	5

* Note: Land interchange is no longer proposed for any alternative (See Section 1.1)

Three public meetings were held in January 1992 to receive comments on the Draft EIS. These meetings were held in Jackson, MS, on January 7, 1992, in Gulfport, MS, on January 8, 1992, and in Hattiesburg, MS, on January 9, 1992. The meetings were announced through a press release from the Mississippi Military Department to press and electronic media representatives (see Appendix P). In addition, advertisements were placed in local papers in

all three cities announcing the dates, times and locations of the public meetings (see Appendix P). There were 43 registered participants at the Jackson meeting; 71 individuals registered at the Gulfport meeting; and 186 individuals registered at the Hattiesburg meeting, a total of more than 300 persons.

An "open house" format was used for the public meetings, opening at 3:00 pm and continuing to 8:00 pm. This format encouraged meeting attendees to come at a convenient time and discuss their questions and concerns, one on one, with representatives from the Mississippi Army National Guard, the U.S. Forest Service, and the U.S. Army Corps of Engineers. Thousands of questions were asked of the National Guard, U.S. Forest Service and Corps of Engineers representatives. Those questions or concerns that participants wanted added to the formal comment record were collected on comment sheets provided to the participants as they registered or at each of the stations in the open house. A court stenographer was also present to accept oral statements of individuals choosing to provide comment in this fashion. A representative of the Mississippi Army National Guard was also present to accept written statements prepared prior to the meetings.

During the public comment period, comments on the Draft EIS were received from 321 agencies, interested organizations, and individuals. This includes all forms of written communication as well as the comments and questions received orally at the public meetings. As a result of this public input, over 2,200 formal, recorded comments, questions, issues or concerns were identified. These comments covered the areas listed in Table 1-2.

In analyzing these, the following major issues were identified as being present in a large number of comments.

<u>Mission and need</u>:

- The need for battalion level task force tracked vehicle maneuver training when the armed forces are reducing numbers.
- The need for the National Guard to train at this level when the role of the National Guard appears to be changing to that of support, non-combat troops.
- There is no analysis that shows this training cannot be done elsewhere, either at an active Army installation or at a base that is scheduled for closure.

<u>Biodiversity</u>:

- This action will adversely affect the biodiversity of the coastal regional ecosystem.

Table 1-2 Concerns Identified During the Public Comment Period

- Aesthetics
- Air quality
- Climate
  - Global warming
- Cultural/historic resources
- Economics
  - County returns
  - Employment
  - Economic benefits
- Editorial
  - Graphics
  - Text
  - Index
  - Bibliography
  - Tables
  - Appendices
- Fire
  - Prescribed burn
  - Wildfire
- Fisheries
- Force structure
  - Base closure
  - Realignment
- Forest fragmentation
  - Biodiversity
  - Habitat
- Forestry
  - Timber
  - Land allocation
  - Industry
- Funding
  - Integrated Training
  - Area Management (ITAM)
  - Mitigation
- Implementation
  - Infrastructure
  - Costs
  - Access
- Leaf River Wildlife Management Area
  - Access
  - Effects on management
- Minerals
  - Access to mineral rights
- Mission and Need for the Action
  - M-1 tank production
  - GAO reports
  - Alternate facilities
- Mitigation
  - Compensation
  - ITAM
- Monitoring/research
- Noise
  - Firing
  - Helicopter
  - Operational
- Petroleum, oils and lubricants
  - Consumption/use
  - Spill control
- Procedural
  - NEPA
  - Master agreement
  - Army regulations
  - Land/Resource Management Plan
- Quality of life
- Real estate
  - Acquisition of private land
  - Property values
- Recreation
  - Hunting
  - Wilderness/scenic river
  - Nonconsumptive uses
- Results and conclusions
- Social
  - Public safety and health
  - Road usage
  - Highway 29, usage and closure
- Soils
- Threatened and endangered species
- Training
  - Training requirement
  - ITAM
- Vegetation
  - Longleaf pine ecosystem
  - Biodiversity
- Water
  - Quality/quantity
  - Surface
  - Groundwater
- Wetlands
- Wildlife
  - Birds
  - Native
  - Neotropical migrants
  - Mammals
  - Habitat fragmentation

Need for adequate mitigation:

- The mitigation proposed for adverse effects to wildlife and wetlands was either inadequate, inappropriate or not specifically stated.

Forest fragmentation:

- The implementation of the proposed maneuver areas will greatly fragment the presently contiguous forest stands and thus adversely affect the forest ecosystem.

- The creation of large open areas in presently forested areas will adversely affect resident interior species and will adversely affect neotropical migrant bird species.

Road closures:

- Implementation of the proposed maneuver areas will cause public roads to be closed for extended periods of time while the areas are in use.

- Intermixing of possible maneuvering vehicles and supply trains with other road users such as school buses, mail routes and individuals travelling to work will create safety problems.

Access to public resources:

- Placement of the proposed maneuver areas in the heart of the Leaf River Wildlife Management Area (LRWMA) will cause public access to one of the oldest wildlife management areas in Mississippi to be decreased.

- Implementation of proposed action would destroy the resources or so severely damage them that they would, in effect, be destroyed.

- Recreational access to the De Soto National Forest will decrease with the implementation of the proposed maneuver areas.

Soil erosion and soil damage:

- Disturbance to soils from maneuvering and other activities will cause severe erosional problems and concomitant sedimentation of streams.

- Soils will be damaged, i.e., compacted, when maneuver training and other activities are conducted on critically wet soils.

- There is a need to determine point at which training will be halted due to soil conditions.

- There is a need to determine if training other than full scale could be done when soils are wet. If other training can be done, determine the soil criteria when this would occur.

Wetlands:

- Soil erosion from the maneuver areas and other use areas at Camp Shelby will damage adjacent wetlands.

- Vehicle and troop activities in the proposed maneuver areas will cross and therefore damage adjacent wetlands.

Alternatives:

- The alternatives proposed represent "straw men" and are not realistic alternatives to the proposed actions but are set up to ensure that the National Guard gets their preferred alternative.

- The EIS needs to examine other areas near Camp Shelby as alternative to provide maneuver training space.

Threatened and endangered species:

- The EIS does not adequately address the effects that the proposed actions will have on threatened, endangered and sensitive species.

- The National Guard may need to enter into consultation with the US Fish and Wildlife Service about the effects of the proposed actions on the red-cockaded woodpecker.

Also identified in the comment review process are areas that were not included, or not emphasized, in the Draft EIS but were identified as needing additional examination or study. These areas include:

- The effects of the proposed actions on the quality of life for adjacent residents.

- The effects of the proposed actions on the accessibility of privately held mineral reserves.

- Added evaluation of nonweapon training noise on sensitive areas (e.g., Black Creek Scenic River and Leaf River Wilderness Area) close to the proposed affected area.

- The origin, history and usage of the Leaf River Wildlife Management Area.

- More site specific environmental information for the evaluation of the Multiple Purpose Range Complex-Heavy (MPRC-H) site.

During the analysis of the public comments, a large number of misunderstandings about the proposed actions and the environment were also identified. Text to provide information to correct these misunderstandings has either been provided in the text of Volume I or in the response to public comments in Volume III. The misunderstandings identified in the analysis, and upon which numerous public comments appear to have been based, include the following:

- Camp Shelby Training Site will be expanded.
- There will be live firing and the use of target acquisition lasers in the proposed maneuver areas.
- There will be direct displacement of civilians through exercise of eminent domain.
- There will be storage of nuclear wastes at Camp Shelby.
- There will be an expansion of the number of tanks which train at Camp Shelby.
- The Special Use Permit area for Camp Shelby represents a majority of the De Soto National Forest.
- The National Guard is proposing to acquire title to the Special Use Permit area.
- There will be an exchange of land between the Department of the Army and the USFS.
- Everything within the outer boundary of a Proposed Training Area will be cleared, stripped and used for tracked vehicle training.
- No military training has ever taken place in the Proposed Training Areas.
- No tracked vehicles have ever been used in the Proposed Training Areas.
- The Leaf River Wildlife Management Area is an untouched preserve.
- Camp Shelby can be closed for little cost.
- There will be no civilian recreational use allowed on the proposed training areas.
- All public roads within the proposed training areas will be closed for extended periods.
- The training proposed to occur will be of increased and greater duration and intensity than occurs presently.
- Alternative 3B is beneficial to wildlife and poses few, or at least fewer, environmental problems.

- Alternative 3B meets the stated needs of the National Guard for task force level training.
- The De Soto National Forest is a pristine longleaf pine ecosystem.
- The use of the Special Use Permit area and in particular the Proposed Training Areas will cause the forest ecosystem to be lost forever.
- Deserts and grasslands (e.g., in the West or Southwest) are better able to withstand this type of training than are southern forests.

1.2 Description of Alternatives

1.2.1 Background

This section discusses six basic alternatives for the continued and reconfigured military training use of De Soto National Forest lands. These alternatives and the associated new facilities and improvements which are proposed to be constructed under each alternative are described below, and summarized in either Table 1-3 or Table 1-4. Although the general locations are indicated in the tables above, the thinned, cleared, and no action areas may change to some extent during implementation. The actual layouts are dependent upon the outcome of site specific engineering plans, as discussed in Sections 1.4 and 1.5. Figure 1-9 shows the relative location of each of the newly Proposed Training Areas, or PTAs, (numbered 1-6 for reference) and the 13 connecting corridors (lettered A through M for reference) proposed above. Acreages for facilities and training areas for all alternatives are shown in Table 1-4.

The organization of the alternatives parallels that presented in the Draft EIS, with modifications which have resulted from issues and considerations raised in the review process. In addition, a Biological Opinion was prepared for the National Guard Bureau by the U.S. Fish and Wildlife Service in September 1992 which addresses the specific actions proposed by the Army. It is included as Appendix L to this Final EIS. Accommodation to the requirements of this opinion has required several small to moderate changes in the proposed layout of the Proposed Training Areas as compared to those presented in the Draft EIS.

Table 1-4 summarizes the training area location, affected acreage, and proposed facilities associated with each alternative. The proposed facilities for Alternatives 1, 2, 3A, and 3B are the same. "Acres Available for Tracked Vehicle Use" represent net area after wetlands, threatened and endangered species areas, buffers, and other areas not proposed for tracked vehicle maneuver are taken into account. The preparers note that the public and reviewers frequently quoted the *gross* area when making comparisons among alternatives, while only the "tracked use" area shown in Table 1-3 is proposed to be made available for tracked vehicle maneuver. Figure 1-10, which is presented at the same scale as Figure 1-9, shows only those

areas within proposed training areas which would be considered either for tracked use or modified for line-of-sight under Alternative 1.

The technique proposed to modify forested areas to provide lines-of-sight and maneuver space was developed with the need to maintain good habitat in mind. As part of the environmental consideration process, Camp Shelby Training Directorate and Facility Engineering staff officers were asked to utilize the environmental constraint map (see Figure 1-8) and detailed knowledge of the applicable environmental constraints to reconfigure, in concept, the proposed training areas into areas suitable for the various tactical scenarios examined in Section 1.2.8.

Through this process a concept for selective timber removal was developed. As a result, much of the forest vegetation is proposed to remain in place to reduce the amount of forest fragmentation even in those areas considered the most severely modified (i.e., PTAs 1-3). Proposed layouts for timber removal are depicted in Section 3.3.2.1. The actual layouts are dependent upon the outcome of site-specific engineering and environmental analyses, as discussed in Sections 1.4 and 1.5. Endangered species locations linked with adjacent wetlands with their buffers and soils poorly suited for tracked vehicle maneuver were utilized in locating no-action areas. These no-action areas were then linked to other forested areas to provide contiguous habitat corridors. Although the general locations are indicated in the figures above, the thinned, cleared, and no action areas may change to some extent following site-specific analysis. The proportionate acreages are realistic and will serve for analytic purposes.

The maneuver areas associated with Alternatives 1-3B have been conceptualized and numeric values have been generated for: 1) acres proposed for clearing and thinning (in order to provide for line-of-sight, timber will be removed in areas with environmental constraints), 2) acres proposed for tracked vehicle maneuver, 3) acres proposed for no action. Examples of no action areas are wetlands with their buffers, soils poorly suited for tracked vehicle maneuver, steep slopes, threatened, endangered and sensitive (TE&S) species habitat and biological corridors used to link adjacent no action areas and existing forest as discussed in Section 3.3.1.3. These areas associated with Alternatives 1-3B, range from approximately 40 to 49 percent. Conversely, the track training acreage ranges from approximately 40 to 50 percent. In all cases, approximately 10 percent is proposed to be cleared for line-of-sight purposes, but not used for tracked vehicle maneuvers.

1.2.1.1 Continuing Army National Guard Training Activities

There are general military training and installation operations, and maintenance and repair activities which are performed on a recurring basis as a result of Camp Shelby's training mission. The manner in which these activities is performed is prescribed in various sections of the SUP (Appendix A). The following activities now take place regularly at Camp Shelby, and are proposed to continue to be performed under Alternatives 1, 2, 3A, 3B, 4 and 5.

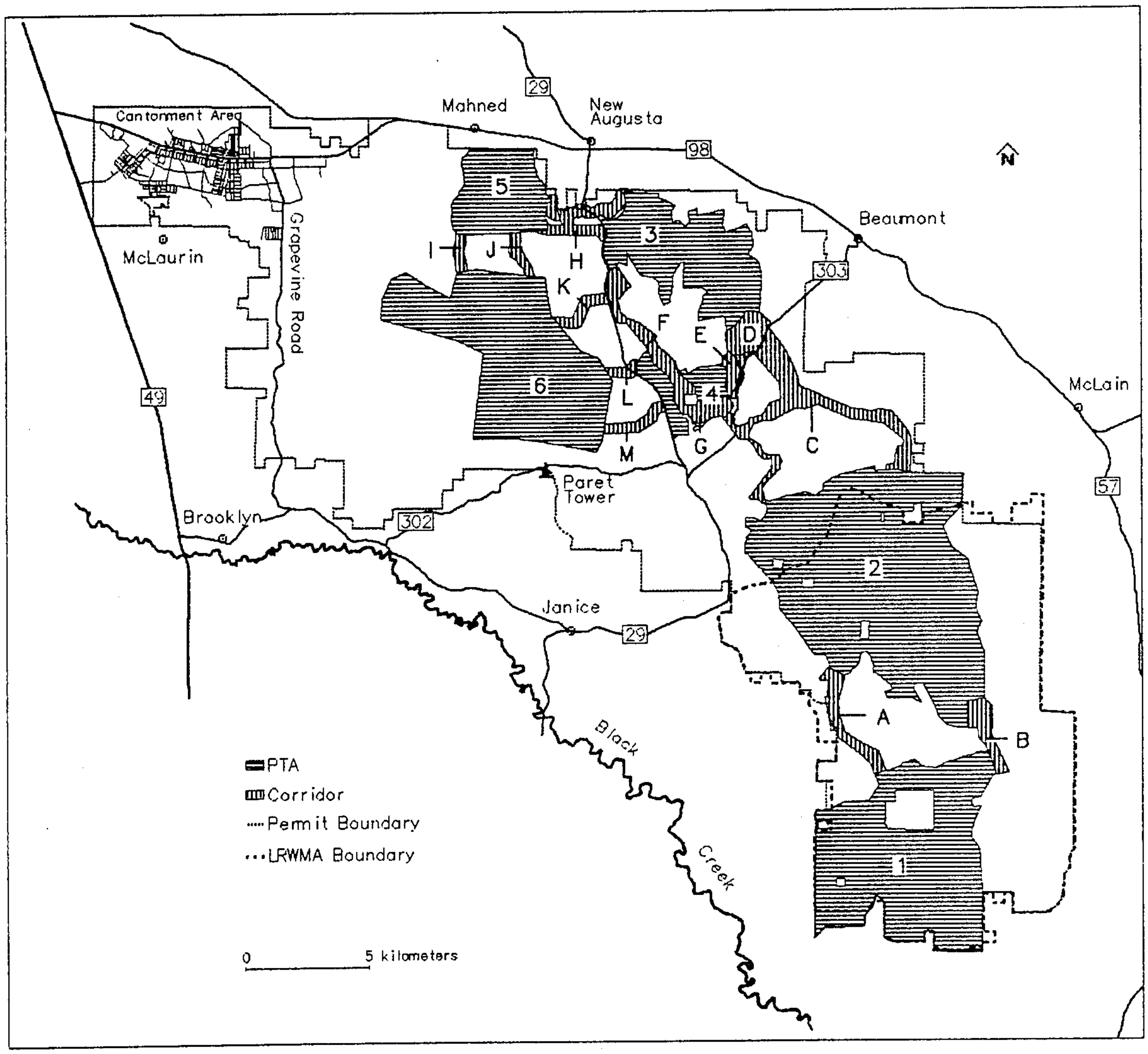


Figure 1-9 Overall Map Showing Relative Locations of Proposed Training Areas and Corridors for Alternatives 1, 2, 3A and 3B

Table 1-3 Gross Area of Proposed Maneuver Training Areas, pgs. 38-39 and Area Available for Tracked Vehicle Maneuvers (Acreages for Alternative 4, existing maneuver areas, appear in Table 1-4)

Proposed Training Area or Corridor	Acres Included: Alternative 1	Acres Included: Alternative 2	Acres Included: Alternative 3A	Acres Included: Alternative 3B
PTA 1	Gross: 9,826[a] Clear/Thin: 4,733 No Action: 5,093 Tracked use: 4,011[b]	Gross: 9,826 Clear/Thin: 4,733 No Action: 5,093 Tracked use: 4,011	Not Included	Not Included
PTA 2	Gross: 15,914 Clear/Thin: 8,949 No Action: 6,964 Tracked use: 7,607	Gross: 15,914 Clear/Thin: 8,949 No Action: 6,964 Tracked use: 7,607	Not Included	Not Included
PTA 3	Gross: 4,856 Clear/Thin: 2,640 No Action: 2,216 Tracked use: 2,133	Not Included	Gross: 4,856 Clear/Thin: 2,640 No Action: 2,216 Tracked use: 2,133	Gross: 4,856 Clear/Thin: 2,640 No Action: 2,216 Tracked use: 2,133
PTA 4	Not Included	Gross: 1,874 Clear/Thin: 1,512 No Action: 362 Tracked use: 1,333	Gross: 1,874 Clear/Thin: 1,512 No Action: 362 Tracked use: 1,333	Gross: 1,874 Clear/Thin: 1,512 No Action: 362 Tracked use: 1,333
PTA 5	Not Included	Not Included	Gross: 2,851 Clear/Thin: 1,302 No Action: 1,550 Tracked use: 1,071	Gross: 2,851 Clear/Thin: 1,302 No Action: 1,550 Tracked use: 1,071
PTA 6	Not Included	Not Included	Not Included	Gross: 9,175 Clear/Thin: 3,112 No Action: 6,064 Tracked use: 2,453
Corridor A	Gross: 608 Clear/Thin: 561 No Action: 46 Tracked use: 485	Gross: 608 Clear/Thin: 561 No Action: 46 Tracked use: 485	Not Included	Not Included
Corridor B	Gross: 522 Clear/Thin: 497 No Action: 24 Tracked use: 414	Gross: 522 Clear/Thin: 497 No Action: 24 Tracked use: 414	Not Included	Not Included
Corridor C	Gross: 2,024 Clear/Thin: 1,899 No Action: 125 Tracked use: 1,546	Gross: 2,024 Clear/Thin: 1,899 No Action: 125 Tracked use: 1,546	Not Included	Not Included
Corridor D	Gross: 557 Clear/Thin: 550 No Action: 7 Tracked use: 405	Gross: 557 Clear/Thin: 550 No Action: 7 Tracked use: 405	Gross: 557 Clear/Thin: 550 No Action: 7 Tracked use: 405	Gross: 557 Clear/Thin: 550 No Action: 7 Tracked use: 405

Proposed Training Area or Corridor	Acres Included: Alternative 1	Acres Included: Alternative 2	Acres Included: Alternative 3A	Acres Included: Alternative 3B
Corridor E	Not Included	Gross: 272 Clear/Thin: 184 No Action: 88 Tracked use: 95	Gross: 272 Clear/Thin: 184 No Action: 88 Tracked use: 95	Gross: 272 Clear/Thin: 184 No Action: 88 Tracked use: 95
Corridor F	Gross: 424 Clear/Thin: 332 No Action: 92 Tracked use: 257	Not Included	Gross: 424 Clear/Thin: 332 No Action: 92 Tracked use: 257	Gross: 424 Clear/Thin: 332 No Action: 92 Tracked use: 257
Corridor G	Gross: 782 Clear/Thin: 694 No Action: 88 Tracked use: 601	Not Included	Not Included	Not Included
Corridor H	Not included	Not Included	Gross: 757 Clear/Thin: 711 No Action: 46 Tracked use: 515	Gross: 757 Clear/Thin: 711 No Action: 46 Tracked use: 515
Corridor I	Not included	Not included	Not included	Gross: 170 Clear/Thin: 170 No Action: 0 Tracked use: 142
Corridor J	Not included	Not included	Not included	Gross: 199 Clear/Thin: 199 No Action: 0 Tracked use: 169
Corridor K	Not included	Not included	Not included	Gross: 289 Clear/Thin: 263 No Action: 26 Tracked use: 195
Corridor L	Not included	Not included	Not included	Gross: 146 Clear/Thin: 52 No Action: 94 Tracked use: 37
Corridor M	Not included	Not included	Not included	Gross: 302 Clear/Thin: 231 No Action: 71 Tracked use: 220
Total Acreage	Gross: 35,512 Clear/Thin: 20,855 No Action: 14,656 Tracked use: 17,459	Gross: 31,824 Clear/Thin: 19,000 No Action: 12,824 Tracked use: 15,995	Gross: 11,601 Clear/Thin: 7,241 No Action: 4,359 Tracked use: 5,820	Gross: 21,883 Clear/Thin: 11,268 No Action: 10,615 Tracked use: 9,036

[a] "Gross" includes all acreage within the proposed maneuver training areas and associated corridor sets.
[b] "Tracked use" designates acreage available for maneuver use by tracked vehicles.

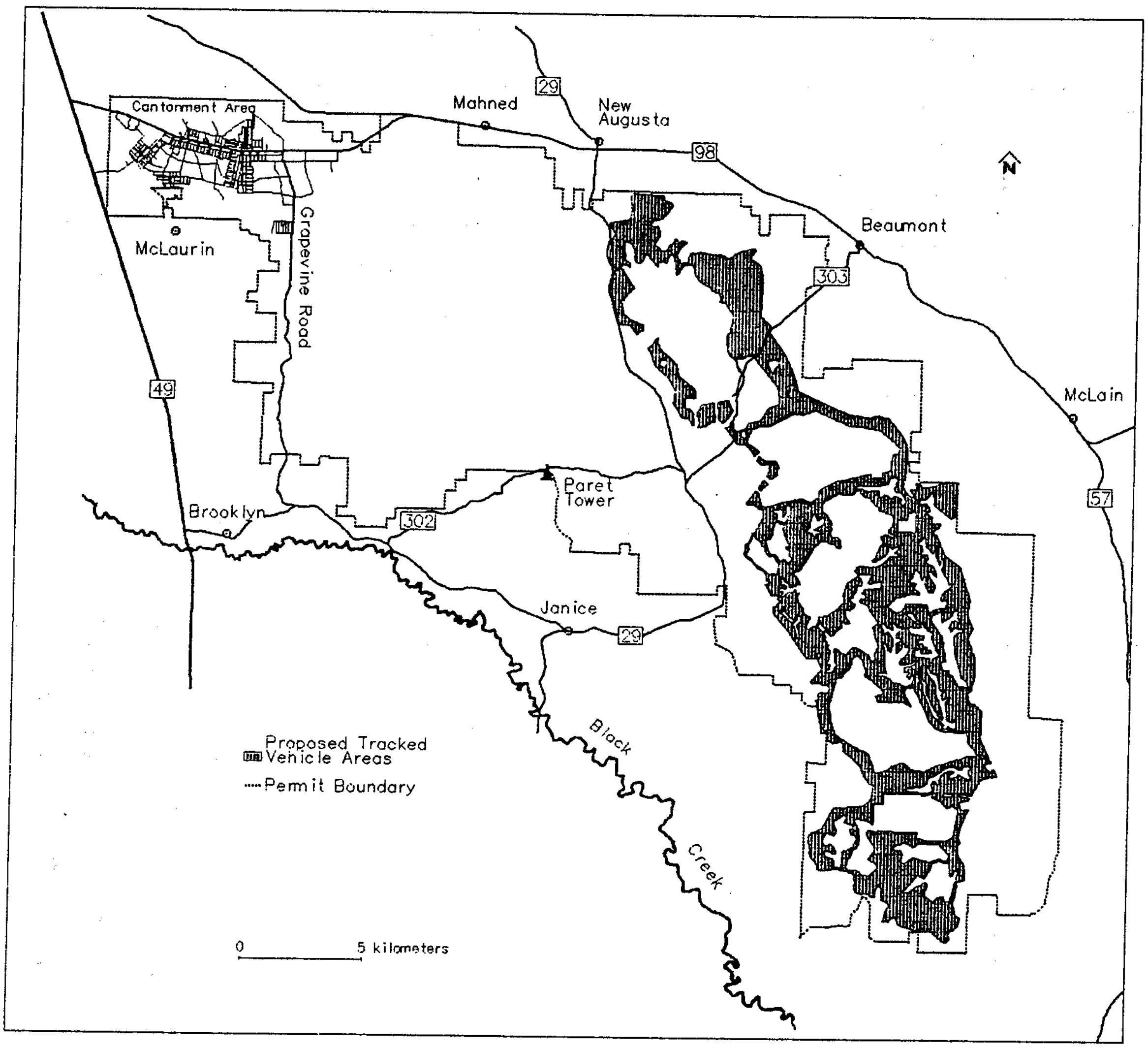


Figure 1-10 Map Showing Proposed Tracked Vehicle Maneuver Areas
Note: Only areas proposed to be cleared or thinned under Alternative 1 are so designated

Table 1-4 Summary of Alternatives Considered

The following table examines only areas proposed for development as vehicle maneuver areas. Other training uses are proposed to continue for the remainder of Camp Shelby, as described in Section 1.2.1.1.

NOTE: [a] USFS administered land
[b] DOD owned/leased land
[c] Sum of USFS and DOD land

ADDITIONAL NOTE: Training areas T-19 and T-43 will be retained in Alternatives 1-4; these training areas contain 758[a] acre of cleared land and 443[a] acreas of thinned land for a total of 1201[a] acres.

Alternative 1 — **Continue Military Training with Provision for New Battalion Task Force Maneuver Area**

Facilities/Improvements:
Automated Tank Table VIII, Multiple Purpose Range Complex-Heavy, Automated Tank Wash, Explosive Ordnance Disposal Facility, Combined Arms Live Fire Exercise Assembly Areas (CALFEX-AA), Tactical Aviation Areas

Proposed Training Areas: 1, 2, 3
Corridors (Refer to Figure 1-9): A, B, C, D, F, G
Gross Acres Available for Training: 34,438[a] + 1,074[b] = 35,512[c]
Acres Cleared: 14,121[a] + 818[b] = 14,939[c]
Acres Thinned: 5,817[a] + 99[b] = 5,916[c]
Acres of No Action: 14,469[a] + 157[b] = 14,656[c]
Acres Available for Tracked Vehicle Use: 16,720[a] + 739[b] = 17,459[c]
Alternative 1 Acres now used for Tracked Vehicle Maneuver: 5,327[a] + 32[b] = 5,359[c]

Alternative 2 — **Continue Military Training with Provision for New Company team Maneuver Area**

Facilities/Improvements:
Automated Tank Table VIII, Multiple Purpose Range Complex-Heavy, Automated Tank Wash, Explosive Ordnance Disposal Facility, Combined Arms Live Fire Exercise (CALFEX) Assembly Areas, Tactical Aviation Areas

Proposed Training Areas: 1, 2, 4
Corridors (Refer to Figure 1-9): A, B, C, D, E
Gross Acres Available for Training: 30,529[a] + 1,295[b] = 31,824[c]
Acres Cleared: 11,960[a] + 778[b] = 12,738[c]
Acres Thinned: 5,978[a] + 284[b] = 6,262[c]
Acres of No Action: 12,591[a] + 233[b] = 12,824[c]
Acres Available for Tracked Vehicle Use: 15,217[a] + 778[b] = 15,995[c]
Alternative 2 Acres now used for Tracked Vehicle Maneuver: 2,836[a] + 113[b] = 2,949[c]

Alternative 3 — **Continue Military Training with Tracked Vehicle Maneuver Limited to Areas Northwest of Forest Service Road 303**

A. Company Team Maneuver Area
B. Multi-Company Task Force Maneuver Area

(continued on following page)

Table 1-4 Summary of Alternatives Considered (con't)

Facilities/Improvements: (For Both Alternatives A and B)
Automated Tank Table VIII, Multi Purpose Range Complex-Heavy, Automated Tank Wash, Explosive Ordnance Facility, Combined Arms Live Fire Exercise (CALFEX) Assembly Areas, Tactical Aviation Areas

Proposed Training Areas:
3A: 3, 4, 5
3B: 3, 4, 5, 6
Corridors (Refer to Figure 1-9):
3A: D, E, F, H
3B: D, E, F, H,I, J, K, L, M

Acres Available for Training: 3A
Gross Acres Available for Training: 10,345[a] + 1,256[b] = 11,601[c]
Acres Cleared: 3,935[a] + 582[b] = 4,517[c]
Acres Thinned: 2,542[a] + 182[b] = 2,724[c]
Acres of No Action: 3,867[a] + 492[b] = 4,359[c]
Acres Available for Tracked Vehicle Use: 5,208[a] + 612[b] = 5,820[c]
Alternative 3A Acres now used for Tracked Vehicle Maneuver: 4,255[a] + 115[b] = 4,370[c]

Acres Available for Training: 3B
Gross Acres Available for Training: 19,380[a] + 2,503[b] = 21,883[c]
Acres Cleared: 4,632[a] + 641[b] = 5,273[c]
Acres Thinned: 5,727[a] + 268[b] = 5,995[c]
Acres of No Action: 9,021[a] + 1,594[b] = 10,615[c]
Acres Available for Tracked Vehicle Use: 8,292[a] + 744[b] = 9,036[c]
Alternative 3B Acres now used for Tracked Vehicle Maneuver: 5,900[a] + 396[b] = 6,296[c]

Alternative 4 **Continue Military Training with Current Activities and Facilities**

Facilities/Improvements: Automated Tank Wash, Automated Tank Table VIII, Explosive Ordnance Disposal Facility, Combined Arms Live Fire Exercise (CALFEX) Assembly Areas

Existing Training Areas: T-16, T-17, T-19, T-21, T-23, T-25, T-27, T-28, T-33, T-38,T-40, T-43, T-47, T-49, T-54
Corridor Set Numbers: Not Applicable
Gross Acres Available for Training: 16,545[a] + 1,019[b] = 17,561[c]
Acres Cleared: 5,617[a] + 1,016[b] = 6,633[c]
Acres Thinned: 9,190[a] + 2[b] = 9,192[c]
Acres of No Action: 1,735[a] + 0 =1,735[c]
Acres Available for Tracked Vehicle Use: 10,339[a] + 747[b] = 11,087[c]

Alternative 5 **Continue Range and Firing Activities but No Off-road Tank Maneuver**

Facilities/Improvements: Automated Tank Table VIII, Multi Purpose Range Complex-Heavy, Automated Tank Wash, Explosive Ordnance Disposal Facility, Combined Arms-Live Fire Exercise (CALFEX) Assembly Areas

(continued on following page)

Table 1-4 Summary of Alternatives Considered (continued)

Proposed Training Areas: Not Applicable
Corridor Set Numbers: Not Applicable
Gross Acres of Maneuver Area: Not Applicable
Net Useable Maneuver Acres: Not Applicable

Alternative 6 **No Action**

Facilities/Improvements: None

Proposed Training Areas: Not Applicable
Corridor Set Nos. (Refer to Figure 1-9): Not Applicable
Gross Acres of Maneuver Area: Not Applicable
Net Useable Maneuver Acres: Not Applicable

1.2.1.1.1 Construction

Ranges, roads, trails, improved wetland crossings, and bridges will continue to be constructed at Camp Shelby. Buildings will be constructed.

1.2.1.1.2 Operation

Ranges, roads, trails, improved wetland crossings, and bridges will continue to be used, creating noise, dust, and soil erosion.

1.2.1.1.3 Maintenance

Ranges, roads, trails, improved wetland crossings, bridges, and training areas will have to be maintained. Soil erosion will have to be addressed on a routine basis for training area rehabilitation. Other routine maintenance will be conducted.

1.2.1.1.4 Military Training and Operational Activities

Operational Activities: Camp Shelby provides administration, training, and logistical support to National Guard units. It must also be prepared to expand and operate as a Forces Command (FORSCOM) installation upon mobilization. The primary function of the Camp Shelby Training Site is to provide the necessary facilities and support for all units training at the installation. This function obligates the installation to provide billeting, mess facilities, health care, administration, procurement for and storage of supplies. In addition it provides community facilities such as recreational, religious and shopping services. Camp Shelby offers its facilities for temporary housing during times of emergency such as evacuations from the gulf coast due to hurricane activity or other regional emergency needs.

Training Mission: The types of units training at Camp Shelby include armor, armored cavalry, aviation, engineer, field artillery, infantry, medical, military police, special forces, support and supply, transportation, headquarters and quartermaster.

Training activities are goal oriented in reference to the Army Training and Evaluation Program (ARTEP). A unit must perform various ARTEP training tasks in order to remain proficient and ready for mobilization. Mission tasks for each unit vary according to the type of unit and the readiness objective for the unit as designated in specific war plans. Readiness level is the status of measured resource areas (personnel, equipment on hand, equipment readiness, and training). The readiness level of C-1 is the highest and indicates that the unit possesses the required resources and is trained to undertake the full wartime mission for which it is organized or designed. Readiness level C-2 indicates the unit has the resources and can accomplish the bulk of the wartime mission while C-3 indicates the ability to accomplish the major portions of the mission. Readiness level C-4 requires additional resources and training but may be able to accomplish portions of the mission.

Annual Training (AT): The prime recruit for the National Guard is the student. Many National Guard members are teachers and college students. Conducting AT during summer months interferes least with students and teachers because this is their regular vacation period. Some early May AT periods do interfere, but these situations are handled on an individual basis by the few units involved.

Inactive Duty Training (IDT):

Units which have training facilities or support equipment located at Camp Shelby, and whose use is proposed to continue, are listed below and on the following page:

In addition to ground based units, Camp Shelby is utilized by aviation units and Air National Guard units from locations in Mississippi and adjacent states. These support requirements are described in greater detail in Appendix C, Part 6.

Camp Shelby is utilized as a training facility for annual training, inactive duty training, weapons qualification, Command post exercises (CPX), Field training exercises (FTX) and other miscellaneous training activities. In summary, the types of present activities, which are expected to continue under most alternatives, are:

Training Activities: Training activities at Camp Shelby occur in either the Cantonment Area or the training and maneuver area, known as the Operational Area.

Unit	Home Location
30th Armor Brigade	Jackson, TN
31st Armor Brigade	Northport, AL

Unit	Home Location
40th Ordnance Detachment (EOD)	Camp Shelby, MS
83rd Field Artillery Battalion (Army Reserve)	Laurel, MS
106th FWD Support Battalion	Monticello, MS
108th Armored Calvary Squadron	Senatobia, MS
114th Field Artillery Battalion	Greenwood, MS
117th Field Artillery Battalion	Birmingham, AL
155th Armor Brigade	Tupelo, MS
181st Field Artillery Battalion	Chattanooga, TN
223rd Engineer Battalion	West Point, MS
890th Engineer Battalion	Gulfport, MS
MS Military Academy	Camp Shelby, MS
NGB Region III NCO School	Camp Shelby, MS
Organizational Maintenance Shop (OMS) No. 6	Camp Shelby, MS
Combined Support Maintenance Shop	Camp Shelby, MS
Mobilization and Training Equipment Site	Camp Shelby, MS
Equipment Concentration Site	Camp Shelby, MS

- Map Exercises (MAPEX): MAPEXs are low-cost, low-overhead training exercises that portray military situations on maps and overlays that may be supplemented with, or replaced by, terrain models and sand tables.

- Tactical Exercises Without Troops (TEWTs): TEWTs are low-cost, low-overhead exercises conducted in the field on actual terrain suitable for training units for specific missions. Using few support troops, TEWTs are used by commanders to train subordinate leaders and battle staffs at any echelon.

- Logistics Areas: Units that are supporting the combat units in training would establish food, fuel, and ammunition field sites (Bivouac Area, Fig. 1-4).

- Tactical Operations Command Post (TOC): Units conducting tracked vehicle maneuver training establish field headquarters responsible for command and control of a particular maneuver element. Brigade, Battalion, and Company TOC's would use these areas (Bivouac Area, Figure 1-4).

- Command Post Exercises (CPX): Units conduct headquarters and staff training without maneuver elements. Only those support vehicles that are found in Headquarters an staff sections will use the area, such as M577 command post vehicles (modified M113 Armored Personnel Carriers) and other light tracked and wheeled vehicles (Bivouac Area, Figure 1-4).

- Situational Training Exercises (STX): They are developed by the service schools to teach the doctrinally preferred way to perform a specific mission.

- Forward Support Battalion (FSB) maintenance areas: Vehicle repair and maintenance would occur in these areas. In simulation of wartime missions, the FSB would actually recover vehicles that breakdown during training in tracked vehicle maneuver areas and tow them to a rear area for repair in order to be returned to the battle as soon as possible. Also, scheduled maintenance of vehicles that the operators are not capable of doing would be done in this area (Bivouac Area, Figure 1-4).

- Bivouac Areas for Crews: Used to support bath points and laundry points where support units rotate combat units from the "front" to allow them to get a whole body bath and clean their clothes for the first time in several days. During this time, the crews will bivouac (i.e., sleep) to get rested before returning to the "front." These services are provided by elements of Forward Support Battalions and other service support units in support of the armor or infantry maneuver training elements (Bivouac Area, Figure 1-4).

- Armored Personnel Carrier (APC) Holding Areas: APC's and various versions of them would park in these areas for bivouac. Tactical maneuver training would not occur. The modern replacement of the M113 APC is the Bradley Infantry Fighting Vehicle (IFV). This vehicle serves the exact same role as the M113 APC while giving the infantry squad it transports and enhanced capability to survive the modern battlefield by providing a faster, better armed and armored transport that is also capable of keeping up with the M1 series of main battle tanks. The Bradley IFV is not a tank (Bivouac Area, Figure 1-4).

- Field Artillery Support Units (Service Batteries/Trains): Field artillery support units would occupy these areas with both tracked and wheeled vehicles in the same manner as FSB and other service support units (Bivouac Area, Figure 1-4).

- Command Field Exercise (CFX): The CFX is an FTX with reduced combat unit and vehicle density, but with full command and control, Combat Support (CS) and Combat Service Support (CSS) elements (Bivouac Area, Figure 1-4).

- Field Training Exercises (FTX): Units training at Camp Shelby during Annual Training will operate under simulated combat conditions. Tactical situations are employed in which one or more units participate, often requiring movement and communications over long distances. Two typical FTXs are described in some detail in Section 1.2.7.

- Fire Coordination Exercise (FCX): FCXs are medium-cost, reduced-scale exercises that can be conducted at platoon, company/team and battalion/task force levels.

- Live Fire Exercise (LFX): LFXs are high-cost, resource-intensive exercises in which player units move or maneuver and employ organic and supporting weapon systems using full-service ammunition with attendant integration of all Combat Arms (CA), CS, and CSS elements.

- Combined Arms Live Fire Exercise (CALFEX): The CALFEX is the CAPSTONE exercise in the training hierarchy - tying together the requirements and the resources of the close combat heavy leader. A combined arms live-fire exercise (CALFEX) trains units to perform primary combat missions in a realistic, live-fire environment.

Firing Activities:

Over the 3 years from 1988 through 1990, the use of firing ranges averaged 280 days out of 365. Weekends were utilized for an average of 42 dates out of a possible 52 dates. Range usage is examined in Section 2.1.1.3 and in Appendix C.

The activities described above are considered characteristic of military training at Camp Shelby, and, with the exception noted below, are proposed to continue at approximately the same level as at present under Alternatives 1, 2, 3A, 3B, and 4. The exception is that the number of weekdays on which tank firing takes place was greatly reduced with the conclusion of the M60A3 program on September 30, 1991. All activities except off-road maneuver training by tracked vehicles will also take place under Alternative 5.

The National Guard proposes to continue to use tank ranges on 28 weekends outside AT, a total of 42 weekends per year, to conduct Tank and Bradley gunnery requirements. This is believed to be almost the minimum number, as discussed in detail in Appendix C, where the added requirements placed upon units by changes in training doctrine and in numbers of vehicles requiring crew gunnery qualification are examined. Other problems which are encountered regularly, and which decrease efficiency of range use include fog, target mechanism breakdown problems, firing vehicle malfunction, intrusion into the safety fan and range and forest fires. Weekday firing which affects areas outside the existing impact area is currently limited to AT without Forest Service approval. The use of small arms ranges which do not require closure of any public access (other than the main impact area and buffer) will continue to be scheduled for weekdays and weekends at any time of the year. Figure 2-1 displays the impact area, intrusion buffer, safety fan and other range locations.

1.2.1.2 Continuing Air Force National Guard Training Activities

1.2.1.2.1 Air to Ground Ranges

The two air-to-ground ranges located on the Camp Shelby Training Site (CSTS) are considered vital to the Air National Guard Combat Readiness Training Center-Gulfport (CRTC-Gulfport) due to their close proximity. Units from various states conduct annual training (AT) at the Gulfport facility and conduct range firing at the two air-to-ground ranges, which are critical to fulfill their annual training requirements. These ranges are range 202E and 201W. Range 201W is located inside the current impact area and is the only air-to-ground range where high explosive bombs can be utilized. Range 202E can only utilize practice ammunition. Air Force and Air National Guard units from AL, MS, LA and FL currently utilize these ranges. Units may be identified as "Daily Units," which normally utilize Camp Shelby ranges without deploying to the CRTC - Gulfport. Eight to ten other units from other states operate as "Deployed Units," which first deploy to the CRTC - Gulfport and then operate from that facility. In calendar year 1992, 2,206 sorties (flights) were made by Air Guard and Air Force aircraft which used the Camp Shelby ranges. During their practice, they dropped 11,000 practice bombs and fired 181,000 rounds of cannon ammunition. Range usage is expected to continue at this level in the future or increase somewhat, depending upon funding availability.

1.2.1.2.2 Air Cargo Drop Zones

Three small air cargo drop zones are located on Camp Shelby (see Figure 1-26). These drop zones are different both in location and character from the parachute drop zones occasionally utilized for parachute jumps by troops. They are used by transport aircraft to practice parachute drops of cargo. These flights utilize multi-engine transport aircraft rather than high-performance fighter-bomber types. Such flights are relatively infrequent as compared to bombing and gunnery missions, typically no more than 50 times per year.

1.2.1.3 Additional Environmental Considerations

Certain conventions apply to the discussion of the alternatives. These do not represent separate alternatives, but are elements of environmental concern which will be evaluated with respect to each action alternative.

For Alternatives 1, 2, 3A, 3B and 4, the following considerations apply:

- Tank ditches will be constructed in the engagement areas for use as defensive positions. The ditches will be up to approximately 3 meters deep by 3 meters across and up to several hundred meters in length. They will be used as part of the training exercises. These will either be semi-permanent earthen structures or will be temporary, and will be filled in, repaired, and revegetated after exercises.

- Defilade positions will be constructed to partially obscure tanks in defensive positions. They are either semi-permanent earthen berms or temporary piles of earth which will be used as part of the training exercises and will be filled in, repaired and revegetated after exercises.

- Maneuver corridors will be up to 400 meter-wide areas, cleared or thinned where environmental considerations, terrain and other conditions allow.

- Rights-of-way for improved roads and trails within maneuver corridors will be cleared to a maximum of 100 feet. All rights-of-way will include a minimum 16 foot wide area which is graveled or limestoned and will use culverts and ditches as needed. When wetlands and watercourses are crossed, an approved crossing improvement, bridge, rock ford, or culvert will be used as appropriate.

1.2.1.3.1 Options for Thinning and Clearing

Treatment in Draft EIS: The following two options were originally considered in the Draft EIS for tree removal in the proposed maneuver areas, with the second later determined to be the preferred alternative:

- Thin trees so they would be spaced uniformly throughout the area, allowing room between trees for safe tank passage. Thirty meter spacing would leave approximately six trees per acre.

- Group trees in islands of variable size, preferably not less than 50 acres each. The density within these islands would vary. By grouping trees in islands, it is intended to minimize environmental impacts and provide cover for tactical maneuvers. For maximum effectiveness, many groups of trees should be linked with drainages and other set-aside protected areas for endangered species. This will have the added benefit of assisting to minimize forest fragmentation (as compared with extensive thinning) and to help maintain biodiversity (Shafer, 1990).

Revised Proposal for Clearing and Thinning: Questions relating to possible forest fragmentation and associated possible adverse effects on local and regional biodiversity resulted in the development of a revised plan for implementing the new maneuver areas. While trees will be removed, as large a block as possible will be left unchanged. Under this revised plan, relatively few small "islands" of forest will be left unassociated with adjacent forested areas. The many categories of lands upon which no tracked maneuver will be proposed, and whose habitat will not be modified in any way, will be connected by undisturbed (or minimally disturbed) forested corridors. A 30 by 30 foot tree spacing will be maintained in proposed thinned areas.

1.2.1.3.2 Currently Cleared and Thinned Areas

The current tank maneuver areas (see Figure 1-4) were established in 1973. They consisted of areas cleared for tank maneuvers about five to eight years previously. Areas which were not cleared were thinned to a spacing of 24 by 24 feet. The previously cleared areas were to be maintained in a cleared status through burning or mowing as necessary. Once thinning was accomplished, maintenance was to be by burning with cutting as necessary.

1.2.1.4 Environmental Issues Not Driven by Alternatives

Several significant issues raised during the scoping process are seen to be related equally to all alternatives in which Camp Shelby remains operational. For action Alternatives 1, 2, 3A, 3B, 4 and 5, the following considerations apply:

1.2.1.4.1 Use of the Tank Gunnery Safety Fans

The area closed as a result of the use of the tank gunnery safety fan is approximately 30,000 acres. This area is closed for safety reasons. As a result, during the closure, public recreational activities are not allowed within the safety fan. Forest management activities also are not conducted during this time frame. Of the 30,000 acres closed, approximately 14,000 acres are part of the existing impact area. The public is permanently restricted from the impact area. During weekend tank gunnery, the tank fan temporarily closes approximately 16,000 acres and (barring unpredictable delay) the fan is opened 95 percent of the time, no later than 2:00 AM on Sundays. Therefore, on weekends the tank fan is closed only on Saturdays, with some occasional use on Sunday during the morning hours. The rest of the time Camp Shelby is open for recreational use, including hunting, in season. See Sections 2.1.2.2, 3.3.2.3 and 3.3.3.4 for further discussion of this issue.

National Guard and Reserve Troops can not train throughout the year, unlike their Active Duty counterparts. National Guard and Reserve Units can typically train only on weekends and during the two week Annual Training (AT) in the summer months. Weekend tank gunnery has proven more effective, overall, than practice conducted during AT periods. Tank gunnery during AT periods on Camp Shelby closes off all of 15 training areas, portions of 9 other training areas, 51 field artillery firing points, 5 mortar firing points, and 3 field artillery forward observer posts. This prohibits full utilization of firing facilities and maneuver/bivouac area for other units.

The National Guard proposes to continue to use safety fan closure on 28 weekends beyond the Annual Training period to conduct Tank and Bradley gunnery requirements. This is believed to be almost the minimum number, as discussed in detail in Appendix C, where the added requirements placed upon units by changes in training doctrine and in numbers of vehicles requiring crew gunnery qualification are examined. Other problems which are encountered regularly, and which decrease efficiency of range use include fog, target

mechanism breakdown problems, firing vehicle malfunction, intrusion into the safety fan and range and forest fires.

1.2.1.4.2 Role of Fire

Questions have been raised as to the possible adverse affect on the local ecosystem of the more frequent fires associated with the artillery impact area. These fires may occur several times a year as opposed to the once-in-two-or-three-year use of prescribed burning in this region. This issue is treated in Section 3.5.4.2 and in Appendix U, where the history of wildfires is examined in some detail.

1.2.1.4.3 Biological Diversity (Biodiversity)

O'Malley and others (1993) point out a growing realization that loss of biodiversity is not restricted to tropical rain forests or the American Pacific northwest, but is a global problem. In the United States, biodiversity conservation is receiving more formal attention at both the state (e.g., Nigh et al., 1992) and federal (e.g., O'Malley et al., 1993) levels. There is an increasing awareness that maintaining biodiversity results not only in healthier and more stable ecosystems but yields immeasurable long term economic and aesthetic benefits to society (Hansen et al., 1991; Solbrig, 1991; Nigh et al., 1992; Allan and Flecker, 1993; O'Malley et al., 1993). The longleaf pine ecosystem has been reduced from over 60 million acres (Wahlenberg, 1946) in colonial days to less than 15 million in 1975 (Croker and Boyer, 1975) and less than 3 million in 1991 (U.S. Forest Survey estimated 2916.6 million acres), thus raising the concern that this loss might also threaten regional biodiversity. The amount of longleaf pine decreased at the rate of 142,000 acres annually from 1985 to 1990. This decrease may be attributed to the conversion of longleaf pine to other timber types and uses on the private and industrial holdings that represent approximately 60 percent of this timber type.

In light of its global importance, biodiversity was identified as a major issue of concern in the Camp Shelby Draft Environmental Impact Statement. In the Draft EIS biodiversity was addressed most often in terms of the number of species present in an area. Based on the recommendations of the Camp Shelby EIS Biodiversity Conflict Resolution Committee (formed in 1992 to examine this issue), a consensus agreement on a new definition was reached and is as follows:

> Simply stated, biological diversity is defined as the variety of genetic combinations, species functions and associations occurring in an area, and the degree representative of the indigenous flora and fauna. Biodiversity is a dynamic principle that contains highly interdependent compositional, structural, and functional components which exists at, and should be viewed from the genetic, species, community, and ecosystem levels. In other words, genotypes, species (including threatened and endangered), or communities should not be viewed in isolation from the ecosystem with which they are thought to be associated, as the complex interactions of the three components are occurring

within and between each level, and without respect to any human delineated boundaries. The FEIS will assess impacts to biodiversity based upon this new definition, and not on species richness.

A list of the committee members and their agency affiliation can be found in Chapter 6, as a special category of persons contacted during the EIS study.

The above-mentioned working definition of biodiversity is brief and therefore contains several very general but important concepts, and because of the high profile of this issue there is adequate justification to elaborate on some of these fundamental issues. These issues include an emphasis on indigenous (native) flora and fauna, those forces leading to increases and decreases in diversity, and the importance of viewing biodiversity from a broader perspective.

Biodiversity is the result of two opposing forces: those that create genetic variability and those that reduce genetic variability. Mutation and recombination are two of the more well-studied genetic phenomena which directly generate diversity. Fragmentation of habitat is an all too common mechanism which effectively isolates populations and prevents or interrupts genetic flow between them. Isolation for long periods of time can eventually result in new varieties or species being formed. Thus, fragmentation has the potential to either decrease (short term) or increase (long term) biodiversity. Biodiversity also increases as individuals immigrate into the population, thereby augmenting and diversifying the genetic pool. Conversely, diversity is decreased by genetic phenomena (e.g., genetic drift), natural selection, and emigration of individuals.

Structural components of biodiversity include genetic configurations, species distribution and abundance, and habitat structure and distribution. Functional components include genetic recombination and evolution, species associations, nutrient cycling and other community and ecosystem processes. Because of its association with the endemic Camp Shelby burrowing crayfish, the pitcher plant bog community's contribution to regional biodiversity is even more important. Nutrient cycling within these bogs is still not completely understood, but is clearly more complex than that characteristic for the adjacent but much drier uplands.

Biodiversity is most often a measure of the indigenous flora and fauna inhabiting an area. Exotic (non-native) species establish themselves in this country somewhat regularly, either accidentally or less commonly by a government agency as a management tool. At least a few exotic species (e.g., the ring-necked pheasant) seem to have "adapted" with no apparent negative impacts on the ecological community. But exotic species more often exhibit differences in behavioral, functional, or reproductive adaptations as compared to the native ecological counterparts. These sometimes subtle differences have enabled some exotic species to out-compete the native species for resources, eventually forcing them out of the area. Thus, the introduction of exotic species has the potential of disrupting or altering intricate ecological interactions and processes involving numerous native animal and plant species which may have taken many thousands of years to develop. The success of the ring-necked pheasant notwithstanding, an informal consensus seems to exist among published

studies that, after a period of adjustment, the majority of exotic species have had a measurable negative effect on biodiversity.

It is also not surprising to note that disagreement exists as to what specific assemblage of flora and fauna represents the natural condition of an area. Regional biodiversity is continually in a state of flux in response to changing physical, biological, and climatic factors. As an example, the assemblages of species and communities in North America underwent very dramatic changes over many thousands of years as mountain ranges were raised and then eroded away, and, more recently, glaciers repeatedly advanced and receded. Fossilized camel tracks can still be seen at White Sands Missile Range in southern New Mexico, yet few of the local people would perceive camels as "native" and proclaim they be reintroduced. What should be considered the native species for the Camp Shelby region? For the purposes of this FEIS, the native ecological communities for the Camp Shelby region are defined as those which are thought to have existed at approximately the time European settlers were colonizing what was to become the eastern U.S. (circa 1600).

In essence, high genetic diversity within a population provides that species with a greater potential to persist in the area after a change has occurred. Fragmentation and subsequent isolation of a population reduces genetic variability. This genetic limitation on a small population can impact the ability to adapt to a habitat change, increase susceptibility to disease, and otherwise increase the likelihood the population will not survive. As Nigh and others (1992) have stated, "Genetic diversity is important to the survival of the species, and species diversity is important to ... the survival of communities and ecosystems."

Military trainers often delineate boundaries, determine the types and intensities of troop activities, and otherwise regulate many of the interactions and functions of their personnel and equipment within these boundaries. Ecologically, however, the Camp Shelby permit area cannot be considered an isolated, autonomous unit in which all the components and interactions are fully understood and can be manipulated to reach a desired result. Biodiversity on Camp Shelby is influenced by, and in turn influences, biodiversity in adjacent areas of the De Soto National Forest and other public and private lands. Wildlife and plant distributions and associations, above/below ground water flow, and other nutrient processes do not originate at one end of Camp Shelby and end at the other. Rather, animals live or pass through areas based largely on habitat characteristics. Biodiversity considerations must therefore include not only Camp Shelby and National Forest lands, but larger areas of the longleaf pine ecosystem as well.

1.2.1.4.4 Tank Maneuver Areas to be Returned to Regular USFS Management

It is agreed by the Mississippi Army National Guard (MSARNG) and the (U.S. Forest Service (USFS) that certain areas originally designated as tracked vehicle training areas are no longer usable for that purpose because they are too small, contain large numbers of sensitive species sites, have no access, or are not suitable for application of AirLand Battle training activities.

The identification of exactly which areas and the time frame in which they are to be returned will be negotiated between the U.S. Forest Service and the MSARNG.

Training Areas 19 and 43 are proposed to be retained for small unit and individual tracked vehicle maneuver training use. Principal use of these areas will be on training weekends.

1.2.1.4.5 Aircraft Noise

Air National Guard aircraft utilize the Camp Shelby impact areas for bombing and gunnery practice. The impulse noise contribution to Camp Shelby range usage has been quantified. The low level flight operations of the jet attack aircraft have resulted in occasional noise complaints from residents living near the installation. Aircraft noise is discussed in detail in Sections 3.1.5.2, 3.2.4 and Appendix I.

1.2.1.4.6 Application of Wetland Buffer Strips

It is agreed that, for all action alternatives, designated wetland areas, including an appropriate buffer zone, will be set aside wherever identified by the USFWS National Wetland Inventory (NWI). Set asides will also be made for smaller wetland areas not identified on the NWI. Following delineation of the boundaries, these areas will be marked so that tracked vehicles will not enter fragile lands. See Section 3.2.2.2 for further discussion.

1.2.1.4.7 Maneuver Use When Soils Are Wet

The National Guard training use of maneuver areas when soils are wet has raised concerns by the public and the U.S. Forest Service. The question of whether, and to what extent, training should be minimized or curtailed when soils are wet is examined in this Final EIS in Sections 3.4.3.1 and 3.5.2.2.

1.2.1.4.8 Closure of Highway 29

There are two issues related to interruption of traffic flow on Mississippi Highway 29. First, at very infrequent intervals, when artillery firing is being conducted from firing points east of Highway 29, all traffic, civilian and military, is stopped for up to two hours. In practice, this takes place approximately three times per year, and public notices are published in local newspapers and broadcast on radio stations in advance.

The second traffic interruption issue, which relates to short-term stoppages to allow military convoys to cross, was emphasized in the public comment period for the Draft EIS. Such stoppages may be up to about ten minutes at a time, and would take place several times per day. They would be somewhat more frequent during the (summer) annual training periods. These effects are examined as a part of the Quality of Life discussions in the Final EIS (see Sections 3.2.4 , 3.4.11 and 3.5.8).

1.2.1.4.9 Fielding and Use of Improved Abrams Tank

Under all alternatives except Alternative 6, some numbers of newer Abrams (M1A1) main battle tanks will be placed in service with National Guard units which train at Camp Shelby. The newest versions of this tank, which were used during Desert Storm, are equipped with an improved main gun. This gun has a bore of 120mm (about 4¾ inches). The previous main gun had a bore of 105mm (about 4⅛ inches). Small adjustments in the layout of firing safety fans, target placement and firing point locations will be made to better accommodate the new main gun. The noise generation characteristics of the 120mm gun are different from those of the 105mm gun, and the installation's impulse noise planning was modified in response to these differences.

1.2.1.5 Task Force Maneuver Area Concept

Three options have been developed for the concept of a task force maneuver area related to the AirLand Battle Doctrine to be implemented under Alternatives 1 and 2. Figure 1-11 illustrates the concept for these linked training areas. These concepts are described below:

<u>Battalion Maneuver Area -- Option 1</u>: This option would include the development of one battalion task force maneuver area of roughly 15,000 acres. The training area would include the following:

- Two smaller areas, each of which (ideally) measures a minimum of 3 kilometers by 5 kilometers and comprises approximately 3,700 acres. Some trees within these smaller areas are to be removed so that approximately 30 to 50 percent of the original forest remains.

- One larger area, which (ideally) measures a minimum of 6 kilometers by 5 kilometers, for a total of 7,400 acres minimum. The most intense maneuver activities are likely to occur in this larger area, and tree removal would retain 25 percent to 40 percent of the original tree cover. Ideally, there should be a 15 kilometer minimum separation between each of the smaller areas and the larger central area.

<u>Company Training Areas -- Option 2</u>: With this option, at least two company team training areas, ideally of about 5,200 acres would be developed. Figure 1-11 illustrates the concept of these training areas. Each company team training area would include the following:

- Two smaller areas, each of which is 2 kilometers by 3 kilometers or about 1,500 acres.

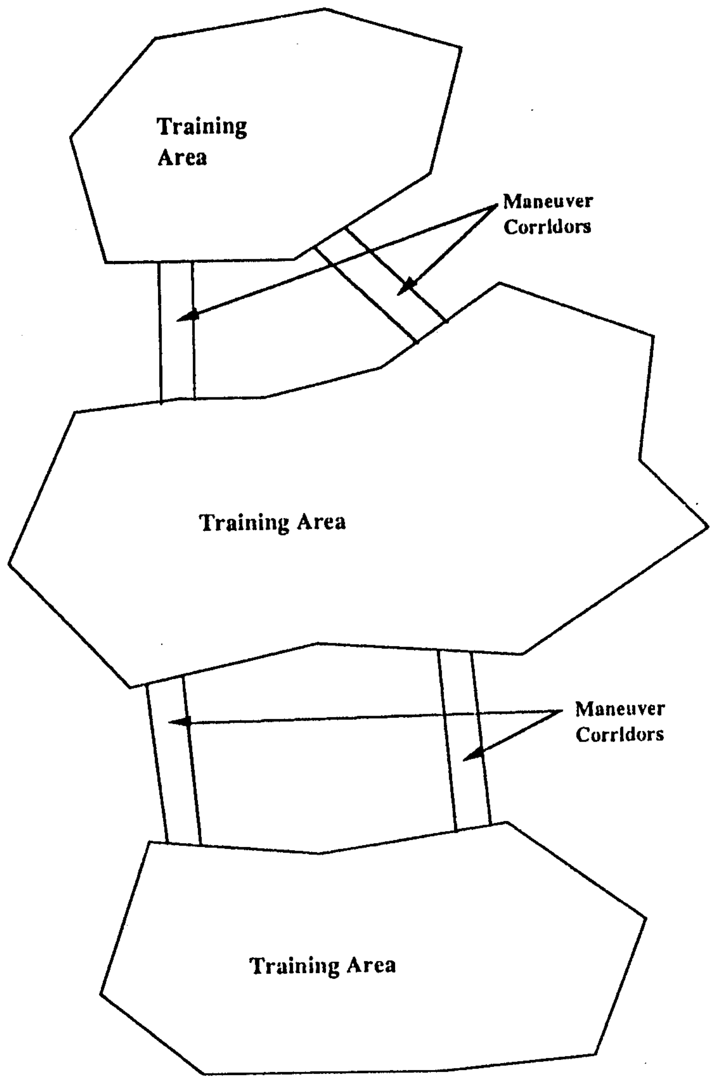
- One larger central area which measures 3 kilometers by 3 kilometers or 2,200 acres. The larger central area and the two smaller areas would be connected by maneuver corridors which are 400 meters wide in which the trees have been removed or thinned. For a discussion of tree removal, see Section 1.2.1.3.1. There should, ideally, be a minimum of 7 kilometers between each of the smaller areas and the larger central area.

Multi-Company/Team Training Area -- Option 3: Of the above options, Option 1 allows for training of two battalions as opposing forces. Option 2 proposes that two companies form the opposing forces. This is the maximum which Camp Shelby now allows, and this only in a limited sense, not being able to present the AirLand Battle concept effectively. A third option was identified during the course of these studies which allows for simultaneous training of more than two companies, but less than two battalions. Conceptually, this becomes a third option for development of possible maneuver areas. One action alternative does provide this capability, and has been designated as Alternative 3.

1.2.1.6 Implementation of Proposed Training Areas

Approximately 50 to 60 percent of the acreage within the outer boundary of each proposed training area is considered *unavailable* for tracked vehicle use. Some of this acreage will have timber removed to maintain line-of-sight in various scenarios. This acreage consists of wetlands and wetland buffers, and several types of areas set aside for various threatened and endangered species. It also contains forested areas set aside as corridors and buffers around and near such sensitive areas. Some of these lands, although not the threatened species areas themselves, may be used if weather and soil conditions allow.

The remaining acreage in each proposed training area would be modified for training purposes. This modification would consist of the activities described in Sections 1.2.1.1 through 1.2.1.4. There will individual project plans prepared which incorporate appropriate mitigation measures for the development of each training area prior to implementation. The coverage of these plans is discussed in Sections 1.4 and 1.5. The overall concept of selective forest modification must take into account certain environmental consequences. These are discussed in Section 3.3.



Level of Training Area	Min. Size of Each Smaller Area	Min. Size of Each Larger Area	Minimum Length of Maneuver Corridors
Company	1,483 acres or	2,216 acres or	7 km.
	2 km. x 3 km.	3 km. x 3 km.	
Battallion	3,707 acres or	7,414 acres or	15 km.
	3 km. x 5 km.	6 km. x 5 km.	

Notes:
* Training areas would be connected by a minimum of two tank maneuver corridors.
* Actual Training areas are reduced in size and/or have shorter maneuver corridors due to land availability, and conflicts with natural resources, land use, etc.

Figure 1-11 Concept Diagram for Task Force Training Areas

1.2.2 Continue Military Training with Provision for New Battalion Task Force Training Area -- Alternative 1 (This is the Army's preferred alternative.)

This alternative meets task force training requirements through battalion level. It facilitates the encampment of a brigade size unit at Camp Shelby with enough area to conduct maneuver in maneuver areas and live fire training on the tank gunnery ranges simultaneously. Present ranges and scheduled range upgrades will provide live fire training capabilities. The development of at least one battalion task force maneuver area will allow task forces to conduct maneuver training to ARTEP standards. Figure 1-12 shows the proposed location of training areas proposed in this alternative. The theoretical concept for the task force maneuver areas, discussed in Section 1.2.1.4, has been adapted to Camp Shelby using the constraints identified in Section 1.1.6 and shown in Figure 1-11.

1.2.3 Continue Military Training with Provision for New Company Team Maneuver Area -- Alternative 2

This alternative does not allow battalion task force maneuver training; however, it facilitates the encampment of battalion size units at Camp Shelby with enough area to conduct company team maneuvers in the maneuver area and live fire training on the tank ranges simultaneously. Present ranges and scheduled range upgrades will provide live fire training capabilities.

The development of at least one company team maneuver area will provide for the conduct of maneuver training through that level.

The company team, being the fighting element of the battalion, will conduct maneuver training with its organic platoons consisting of a total of approximately 15 to 20 tracked vehicles per team.

Figure 1-13 shows proposed locations for the training areas proposed in this alternative. The theoretical concept for the task force maneuver areas, discussed in Section 1.2.1.4 above, has been adapted to Camp Shelby using the environmental constraints revealed by GRASS (Figure 1-8).

With this alternative, the company team unit is the highest level that can receive maneuver training within Camp Shelby. While this is somewhat beneficial to the individual company units, and to a lesser degree, individual battalions, it does not allow battalion task force maneuver training. Synchronization of combat, combat support, and combat service support systems occurs primarily at battalion level.

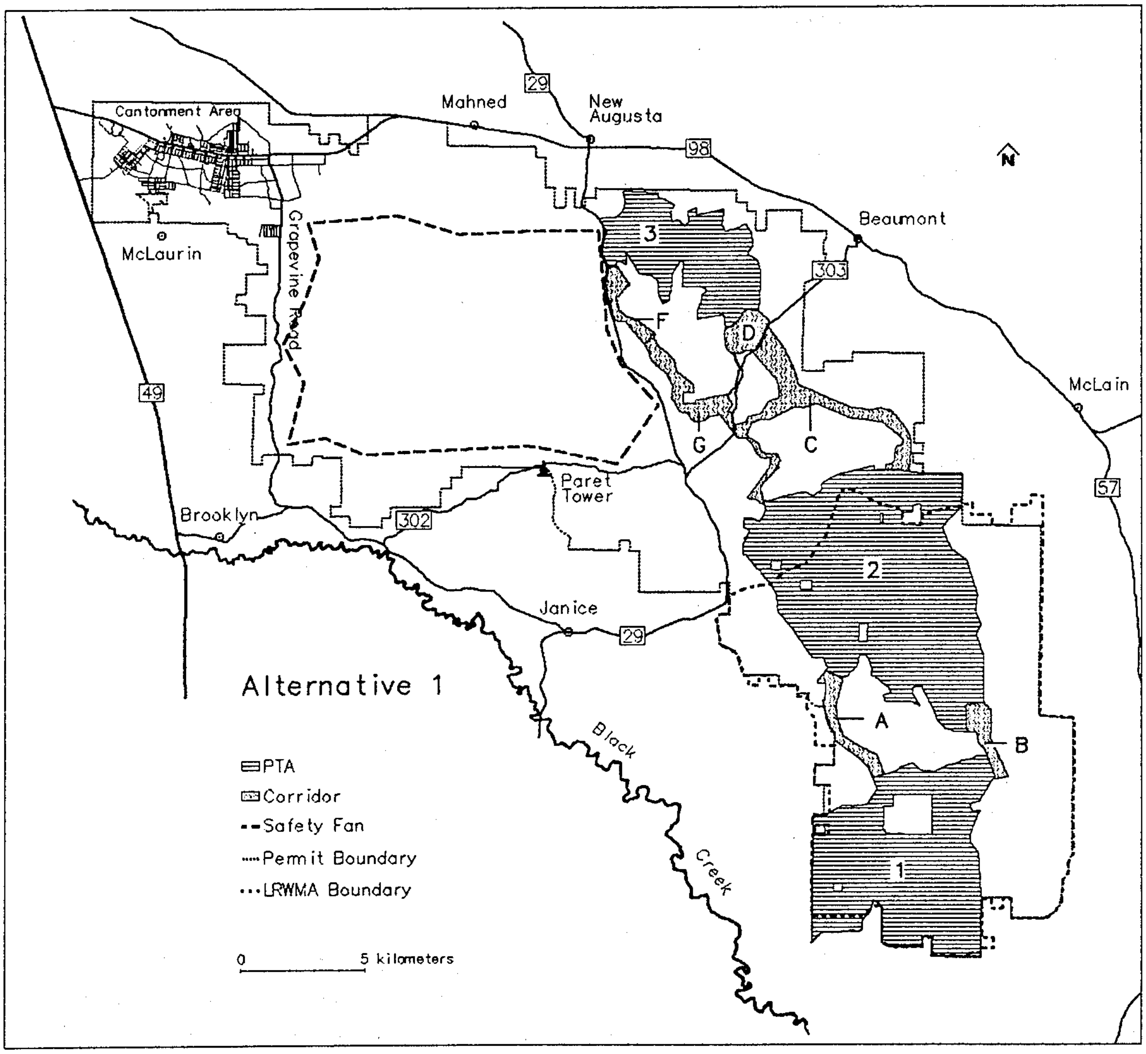


Figure 1-12 Proposed Location of Training Areas, Alternative 1

1.2.4 Continue Military Training with Tracked Vehicle Maneuver Limited to Northwest Section -- Alternative 3

This alternative would restrict off-road tracked vehicle maneuver activity to the area north and west of USFS Route 303 (Eight Mile Road). This alternative was suggested during public scoping meetings (see Section 1.1.7). Two sub-options have been identified within this overall constraint: 1) company team maneuver area, and 2) multi company maneuver area. Under both of these sub-options, an interior gravel road would have to be constructed in Proposed Training Area (PTA) 5 to provide more than one movement corridor. This road would be approximately 16 feet wide and would have two stream crossings.

Company Team Maneuver Area -- Alternative 3A: The possible creation of this two company-team maneuver area is based on the need to meet the requirements proposed in Alternative 2 above, while not proposing to locate any maneuver training southeast of Highway 29 and FS 303. The usable acreage under this alternative, however, because of environmental constraints, is far less than would appear. Figure 1-14 shows locations of Training Areas proposed in this alternative. Only limited tank movement is possible in PTA 5. Tracked vehicle movement will be limited mainly to ridgetops (about 1,200 out of 5,000 acres) due to steep slopes and fragile soils. PTA 5 will be used mainly as an area to assemble and move to PTAs 3 and 4 for maneuver. This severely restricts maneuver space for training purposes. This space restriction does not exist under Alternative 2. Much of the area is already cleared.

This alternative would permit some restricted maneuver and other training activities for company team units and is designed to provide troops with somewhat greater experience than is possible under the existing configuration. It does lie completely outside the tank gunnery safety fan.

Multi-Company Maneuver Area -- Alternative 3B: The possible creation of a multi-company maneuver area within this area would be to meet many of the same requirements as in Alternative 1 above. However, the usable acreage under this alternative, which does lie within the safety fans and has many environmental constraints, including the highest percentage of area containing threatened and endangered species, is also far less than it might appear. Maneuver space is severely restricted. With this option, the largest training area is within the tank gunnery safety fan; thus, firing and maneuver activities cannot be conducted simultaneously. Both Alternative 3A and 3B would require much more frequent crossing of Highway 29 during the course of exercises than would other alternatives. This alternative has thus been named a "multi-company" training area, with the understanding that it cannot meet full requirements for training opposing battalions. Figure 1-15 shows proposed locations of training areas for Alternative 3B.

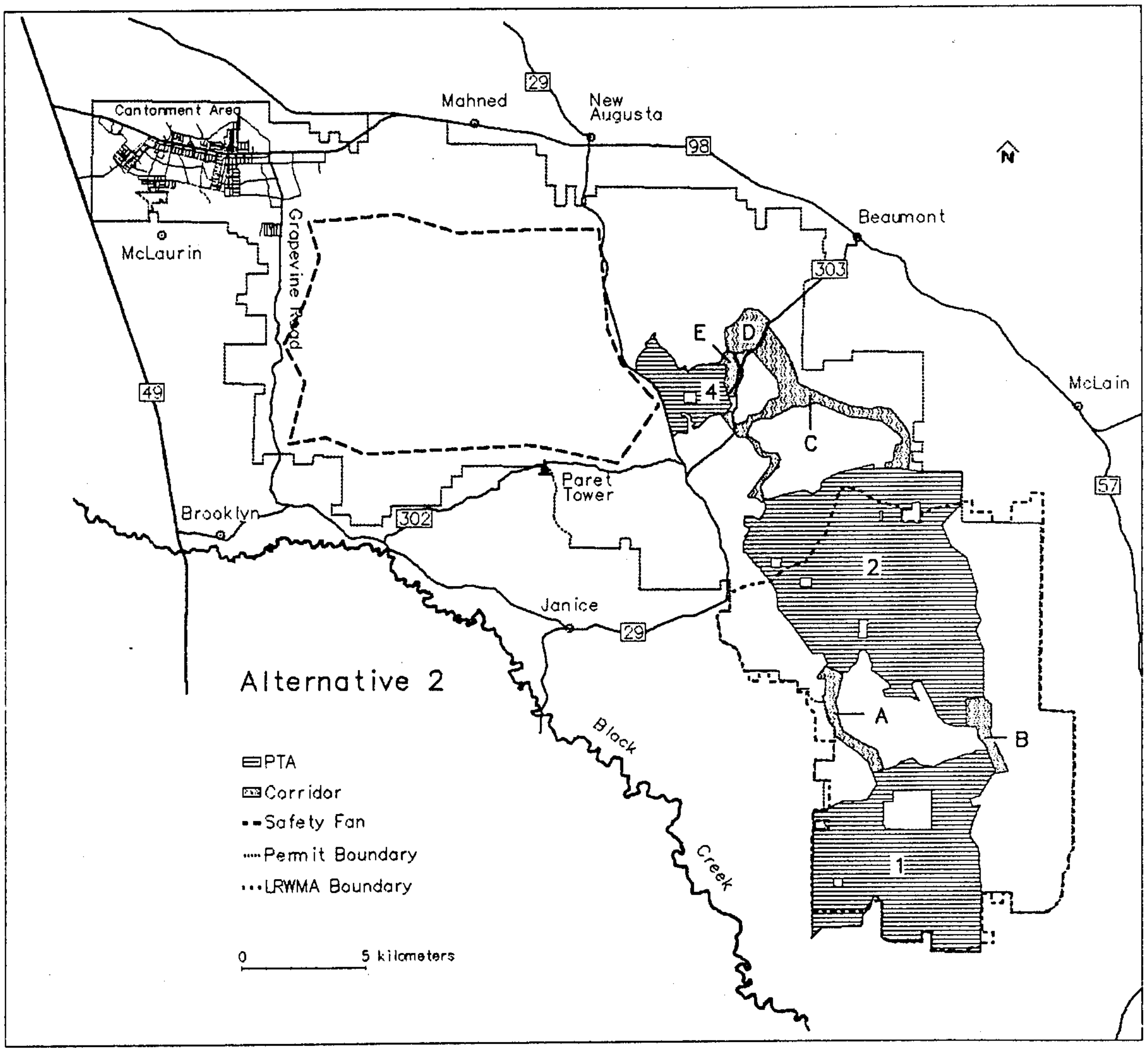


Figure 1-13 Proposed Location Training Areas, Alternative 2

1.2.5 Continue Military Training with Current Activities and Facilities -- Alternative 4

With this alternative, maneuver areas at Camp Shelby would be largely unchanged (see Figure 1-4). No new tracked vehicle maneuver areas are proposed. However, other facilities listed in Table 1-4 would be constructed. All current training activities would be maintained. Maneuver and range activities would be limited by the restrictions of existing facilities. Battalion task force maneuvers are not possible because there is not a large enough contiguous training area. The lack of tracked vehicle maneuver area would continue to restrict forces to training at the platoon and company level.

The field maneuver capability would remain insufficient to provide troops with the experience of the pace, distance and intensity of a real battle situation. Troops training at Camp Shelby would not receive fully adequate training to permit them to sustain combat readiness.

1.2.6 Continue Range and Firing Activities but with No Off-Road Tank Maneuver -- Alternative 5

With this alternative, small arms firing, artillery firing, non-tank unit field training, air-to-ground ranges, and tank gunnery would be conducted. Tanks would be confined to improved roads and trails. Camp Shelby would continue to provide range facilities for use by all Army National Guard units, as well as Active Army, Army Reserve, Air Force Reserve, Air National Guard, Navy Seabees and ROTC. Weapons systems employed in firing activities would span the 5.56mm rifle to the 8 inch howitzer and both eye-safe and non-eye-safe lasers. Firing ranges serve individual and crew operated weapons artillery and mortar firing, anti-tank weapons and demolition charges.

There are 114 field artillery firing points for weapons ranging in size from 105mm to 8 inch. There are 17 mortar firing points within the installation for mortars from 60mm to 107mm.

Artillery firing points are located within the operational area. They fire into a common impact area 4,000 meters wide and 4,000 meters deep. The impact area is surrounded by a buffer zone comprised of the safety fans required by the ranges. Eye-safe Multiple Integrated Laser Engagement System (MILES) lasers are used with weapon systems throughout the ranges and training areas. Non-eye-safe lasers are used only on those ranges which can be barricaded and closed from access. These ranges are also inspected and approved by the Army Environmental Hygiene Agency (AEHA) in accordance with standards set by the Surgeon General (The Surgeon General. Occupational and Environmental Health: Control of Hazards to Health from Laser Radiation, 20 Jun 85).

With this alternative, all existing facilities at Camp Shelby would remain in operation with the exception of the 15 tracked vehicle maneuver areas.

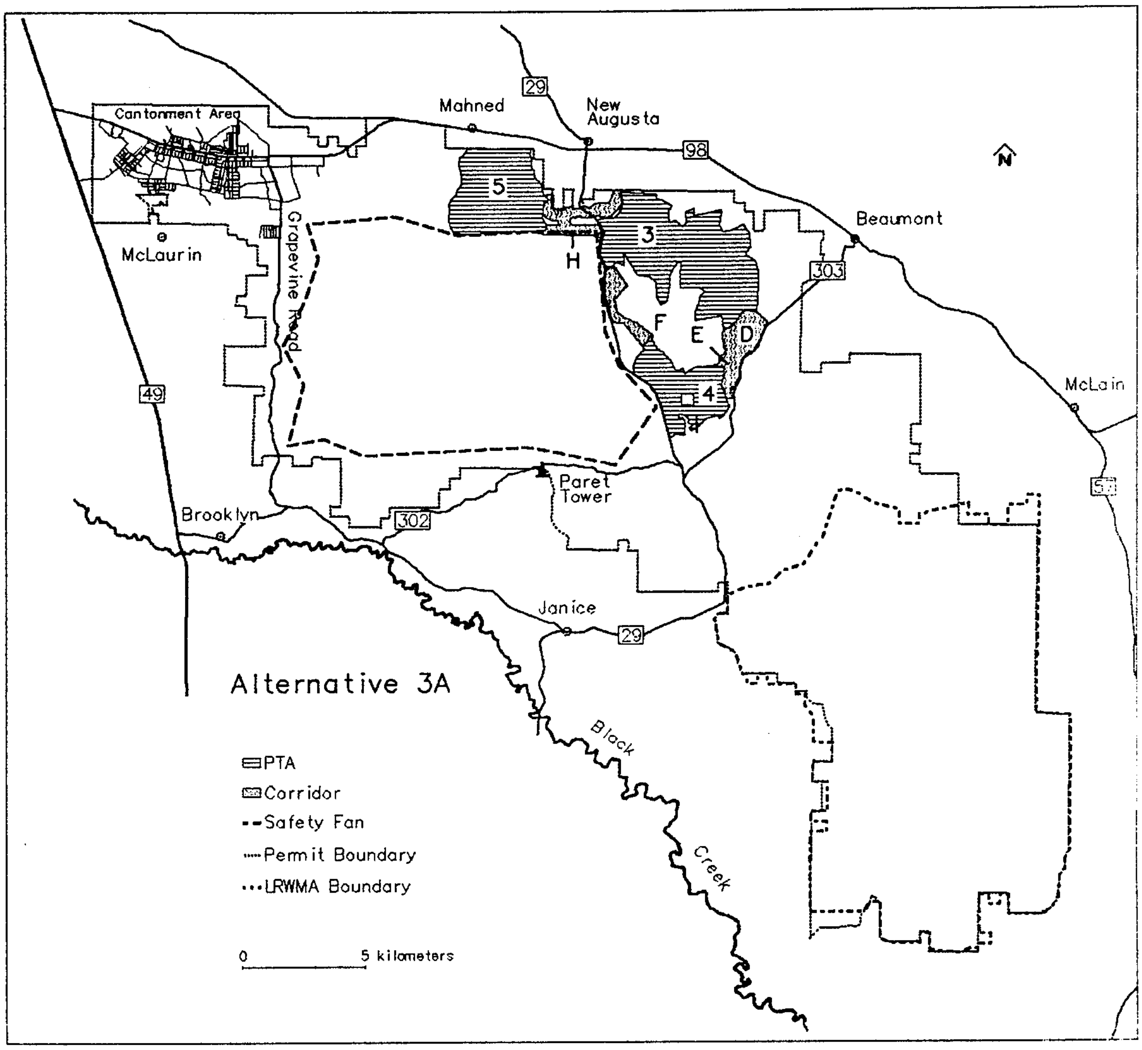


Figure 1-14 Proposed Location of Training Areas, Alternative 3A

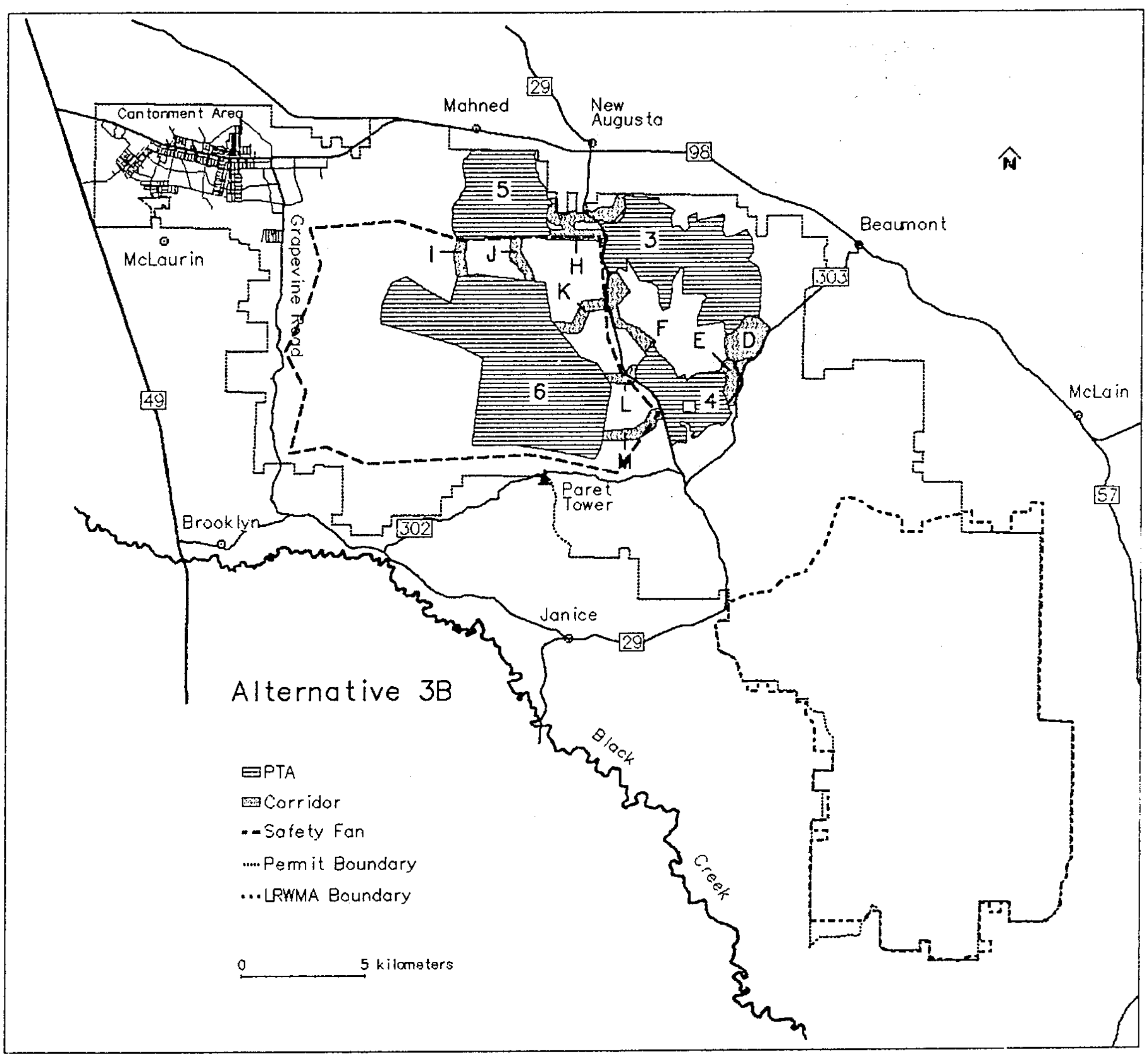


Figure 1-15 Proposed Location of Training Areas, Alternative 3B

This alternative would involve a major change in the use of Camp Shelby for National Guard training activities. During the summer, a major objective of the Annual Training encampments is training in maneuvering, tactical movements and coordination at battalion or brigade levels (Appendix C). If tracked vehicle maneuvers are not permitted at Camp Shelby, Annual Training encampments would have to be held at other military installations with the same attributes as in Alternatives 1 or 2 (Section 1.2.2 and 1.2.3).

1.2.7 No Action (Discontinue Military Training) -- Alternative 6

Under this alternative, all military training and other military functions at Camp Shelby would be stopped. Military facilities would be closed and all National Forest land now under the present Special Use Permit, excluding the impact area which is considered contaminated (see Section 3.6), would eventually return to multiple use management by the U.S. Forest Service. The Mississippi Army National Guard, as well as many units from Alabama, Tennessee and other states, would be required to use training facilities in other states. Refer to Appendix C and Section 1.2.1.1.4 for a listing of the units which now use Camp Shelby as their primary training site.

1.2.8 Scope of Proposed Training Activities

The military training activities proposed to continue at Camp Shelby are similar to those which have taken place in the recent past. The increased capability which will accompany the implementation of the preferred alternative is expected to allow for completion of a fuller set of the training activities which characterize the missions of the various branches which use Camp Shelby for training. Thus, the nature of the activities described in some detail in Sections 1.2.8.1 and 1.2.8.2 is identical to that of training now performed. The number of troops, vehicles, and training days is not expected to increase. The tempo and level of completeness of training events is proposed to increase, as the training exercises become more realistic, and more comparable to anticipated tactical situations and to the level of training experienced at major FORSCOM installations.

1.2.8.1 Armor and Mechanized Training

1.2.8.1.1 Unit Mission and Composition

The desire to better provide for the full training requirements for armor and mechanized units is at the heart of the proposals above for development of new training areas which are in a different relationship to each other. Camp Shelby is designated as the home installation for three brigades of such units, and is the primary location at which annual (normally once-a-year) and individual (normally one weekend a month) training is conducted for these units. A complete overview of the type of training conducted by such a unit is presented below. Further detail of the typical conduct of such training is given in Appendix C.

Overall Mission: The mission of an armor/mechanized infantry units is to alert personnel, load all assigned equipment and personnel, and deploy by air, sea, and land anywhere in the world to conduct mobile, combined arms offensive and defensive operations. A pure maneuver battalion is equipped with one type of equipment. In the case of an armor battalion, the main piece of equipment is the M1A1 main battle tank. In the case of a mechanized infantry battalion, the main piece of equipment is the M2A2 or the M3A2 Bradley infantry fighting vehicle. Two of the many and varied combat operation scenarios that these two types of units perform include the missions; 1) conduct deliberate attack, and 2) conduct defense in sector. These two broad missions are presented here as typical of the events that may occur at Camp Shelby during the execution of these missions. The descriptions assume the new training areas as described for Alternative 1 are available.

Operational Constraints: Although Alternative 1 does not fully meet every idealized doctrinal standard for battalion task force maneuver, few facilities in the continental United States do. Within the boundaries proposed in Alternative 1, a somewhat limited (scaled down) operating area is acceptable to teach the doctrinal basics of the required mission essential tasks. Areas designated as tracked maneuver area will support battalion task force level training. Training areas surrounding the designated tracked maneuver area and inside the Special Use Permit boundaries will be utilized by support elements that do not have tracked vehicles. The following example provides a typical task organization and maneuver scenario for the essential missions "Deliberate Attack" and "Defense in Sector" which may be conducted during Inactive Duty Training (IDT/weekends) and Annual Training (AT/summer training).

This exercise could entail use of either one or two battalion size units. (A Brigade, in the reserve components, normally has three such battalions.) An armor battalion task force would consist of 44 M1A1 main battle tanks, 13 Bradley fighting vehicles, and associated support equipment. A mechanized infantry battalion task force would consist of 55 M2A2 Bradley infantry fighting vehicles, 12 M3A2 Bradley infantry fighting vehicles, 14 M1A1 main battle tanks, and associated support equipment. Alternative scenarios may involve more or fewer combat vehicles of each type depending on the type unit, mission analysis and training requirements.

Frequency of Operations: The units that currently utilize Camp Shelby would be expected to conduct individual battalion level exercises approximately nine times per year (i.e., once per battalion) in an AT status and 8-14 times or more during IDT periods. These exercises may be conducted in combinations of platoon, company or battalion levels during both AT and IDT. Typically, training exercises are conducted around the clock (24 hrs) and in all weather conditions.

(1) Battalion Level Exercise: A battalion level exercise theoretically requires the use of a land area approximately 5 miles by 20 miles. One battalion may conduct training in this area at a given time or two battalions may operate in this area simultaneously. The following types and quantities of equipment and personnel are typical in an armor and mechanized infantry battalion:

- 579 personnel
- Armored vehicles, including 58 M1A1 tanks and 25 APCs and Command Posts
- 120 wheeled vehicles, including 50 2½-ton trucks and 27 High Mobility Multiple Purpose Wheeled Vehicle (HMMWV)

(2) Company Level Exercise: A company level exercise theoretically requires the use of a land area approximately 1.5 miles by 4 miles. Eight companies may be involved in separate training problems at any one given time. The following types and quantities of equipment and personnel are typical in an armor and mechanized infantry company, but do not exactly represent any one unit.

- 140 personnel
- 24 armored vehicles, including 13 M1A1 tanks
- 30 wheeled vehicles

(3) Platoon Level Exercise: A platoon level exercise theoretically requires the use of a land area approximately 0.4 miles by 2 miles. Twenty-four platoons may be involved in separate training problems at any one given time. The following types and quantities of equipment and personnel are typical in an armor and mechanized infantry platoon, but do not exactly represent any one unit.

- 25 personnel
- 4 armored vehicles, including 3 M1A1 tanks
- 5 wheeled vehicles

1.2.8.1.2 Conduct of Typical Offense and Defense Exercises

Exercises During Annual Training: Mission essential collective tasks are collective training sub-elements of missions at platoon, company and battalion level. The following is an example of collective sub-elements of the missions 1) Conduct Deliberate Attack, and 2) Conduct Defense in Sector. Both of these operations are conducted as combined arms activities. For example, field artillery provides fire support, air defense provides counter air support, combat service support units provide logistical support, tactical air and army aviation provide air support, combat engineers provide mobility, counter mobility and survivability, nuclear, biological and chemical (NBC) units provide nuclear, biological and chemical defense and military intelligence units provide electronic warfare support. A representative example of mission essential collective tasks listed in chronological order which supports these missions are defined below. These tasks are not all inclusive, nor is the description definitive, but are typical examples. Greater detail may be found in Appendix C.

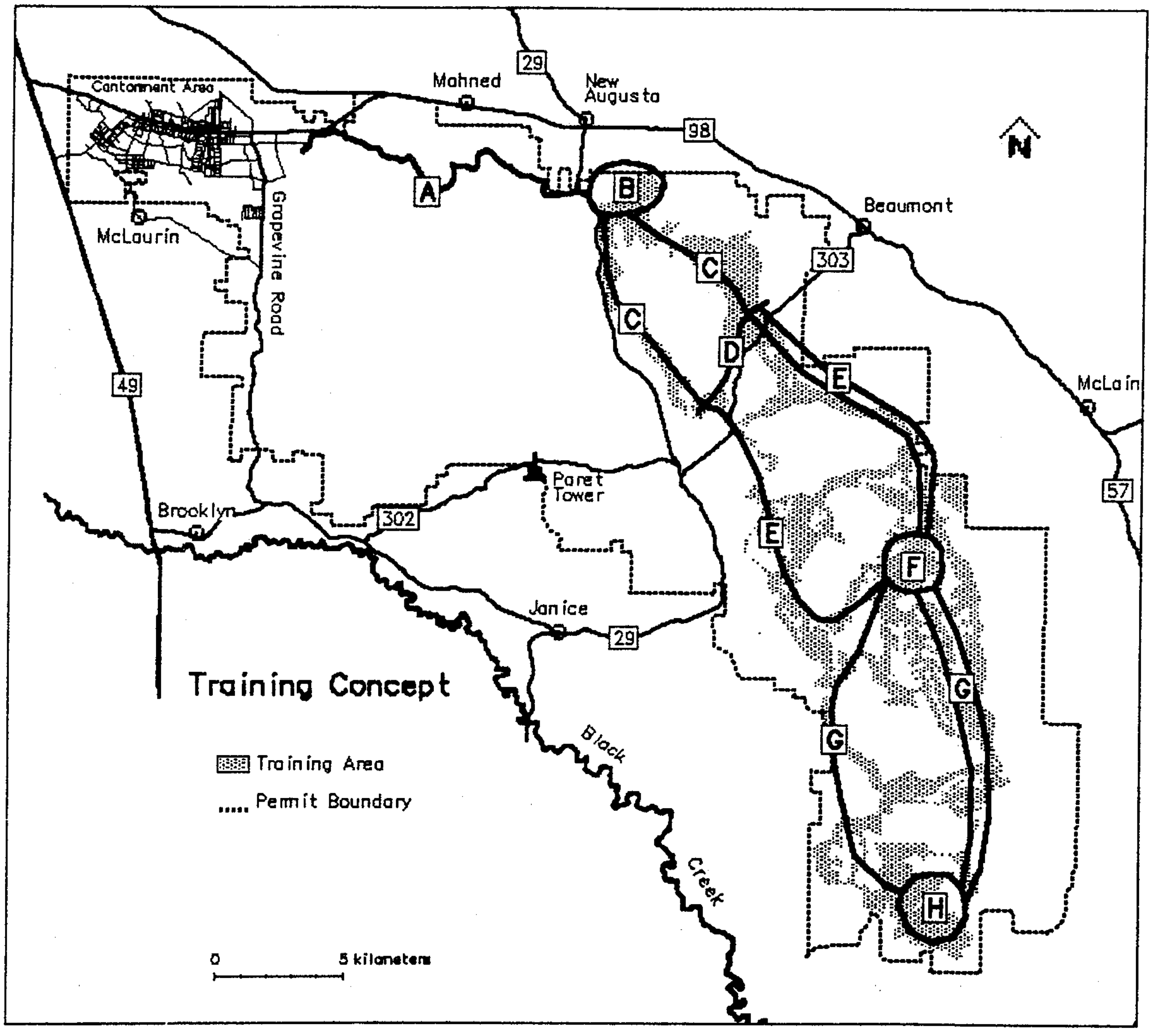


Figure 1-16 Concept for Operational Order - Deliberate Attack

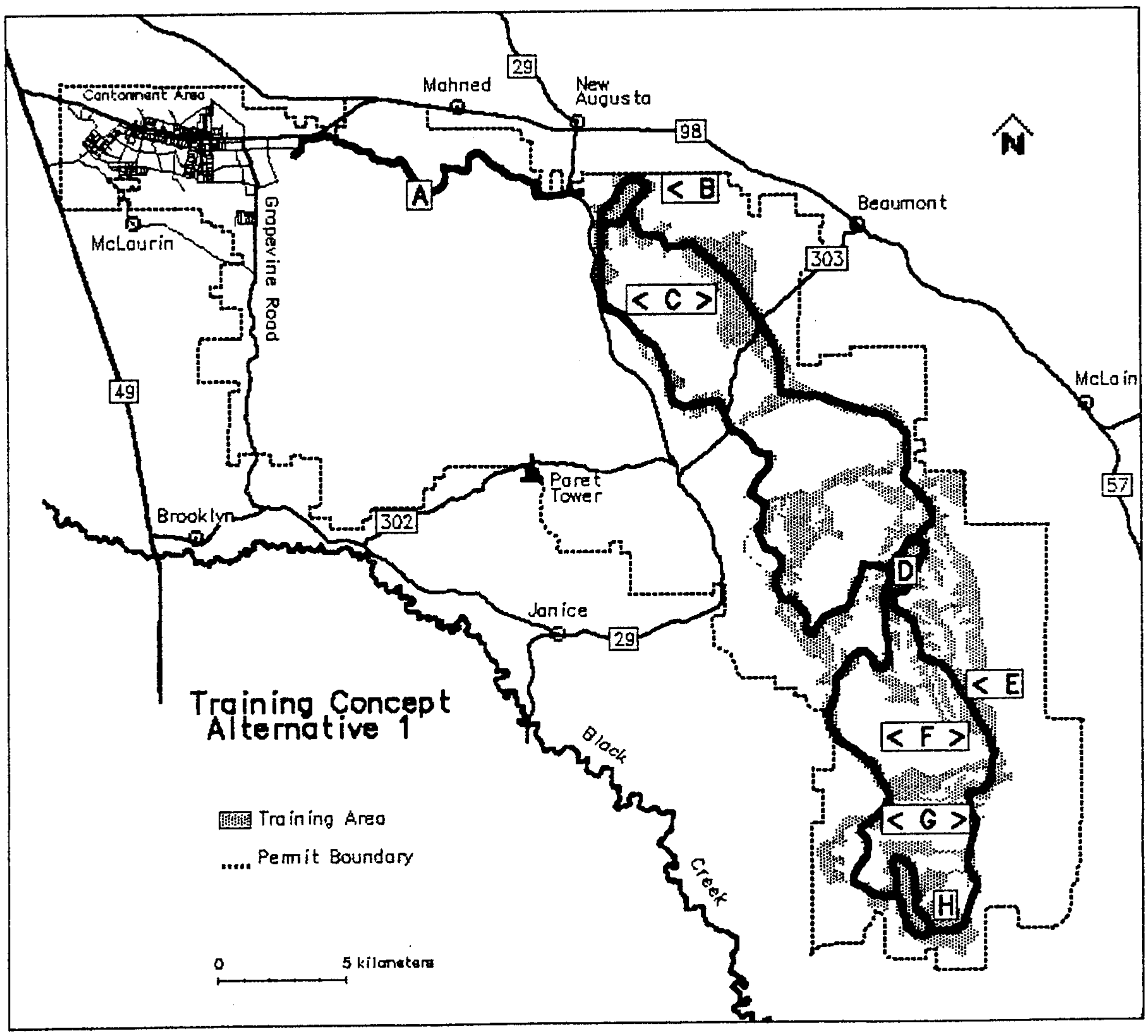


Figure 1-17 Concept for Operational Order - Deliberate Attack Adapted to Proposed Camp Shelby Training Areas, Corridors and Travel Routes

(1) Conduct Deliberate Attack: Collective tasks typically include the following. Overall duration of this type exercise is approximately 48 hours. The overall, conceptual, operational order for such a training problem is illustrated in Figure 1-16, where it is placed on the backdrop of those areas proposed to be made available for tracked training under Alternative 1. The even broader concept of task force training is discussed in Section 1.2.1.5, and the diagram in Figure 1-16 may be related to the overall concept which was shown in Figure 1-11. This concept of an operations order for an armored/mechanized attack scenario may be further adapted to the actual proposed maneuver areas, corridors and travel routes proposed to become available under Alternative 1. These routes of travel are shown in Figure 1-17, where the letters pointing to different locations are keyed to paragraphs (A) through (H).

(A) Initial tactical road march -- A tactical road march involves movement of all organic vehicles from on post area to a bivouac site. In the operational area the initial tactical road march may occur during day or night depending on mission requirements and would be conducted on all major road networks leading to and from the maneuver training areas. For a full battalion, it might require up to 2 hours or more of traveling time.

(B) Occupy an assembly area -- Occupying an assembly area involves the battalion entering a coil formation, 360 degree perimeter, in an area approximately three miles square.

Standard occupation time is 45 minutes. Armored vehicles will be started at intermittent intervals with primary traffic consisting of wheeled support vehicles. Duration of time spent in the assembly area will normally not exceed 24 hours. During this time units conduct command and control tasks, resupply of fuel and ammunition, perform maintenance, feed the troops, and rest. Feeding troops involves establishing a mobile field kitchen and feeding operation. Field sanitation (latrines) would be supplied in the maneuver training areas by contract and coordinated by the using unit and Camp Shelby training site.

(C) Second tactical road march -- This tactical road march involves movement of all organic vehicles from the bivouac site to the line of departure. This road march may be conducted along multiple routes. The length and duration of the march and consequent noise generation will be dependent on each specific operations order and the number of routes designated. A typical section or serial of a tactical road march would consist of a company size unit without some of its organic logistical support vehicles. Logistical support is typically centralized in one or two areas under the control of the parent battalion task force. The following organization and type/quantities of equipment typifies a maneuver unit serial in this type of tactical road march:

All vehicles would be typically dispersed 50 to 100 yards apart depending upon the dust conditions created by the road march and would be conducted on the existing and proposed road network leading to and from the maneuver training areas. The lead platoon would consist of 4 combat vehicles (M1A1, M2A2, M3A2) in a column or staggered column covering a total distance of approximately 300 to 500 yards. The second element, the unit command section, would follow at approximately 50 to 100 yard interval and would consist of one combat vehicle (M1A1, M2A2) and a fire support vehicle from the field artillery. Total distance covered by this element would be approximately 100 to 200 yards. The third element would follow the command section at approximately 50 to 100 yards interval and would consist of a platoon size element consisting of 4 combat vehicles (M1A1, M2A2, M3A2) in a column or staggered column covering a total distance of approximately 300 to 500 yards. The fourth section, the units logistical support, would follow at approximately 50 to 100 yard interval and would consist of one combat vehicle (M1A1, M2A2), the unit maintenance section consisting of two armored tracked vehicles and a medical evacuation section consisting of one armored tracked vehicle. Total distance covered by this element would be approximately 300 to 500 yards. The fifth and final element would follow the units logistical support element at approximately 50 to 100 yard interval and would consist of a platoon size element consisting of 4 combat vehicles (M1A1, M2A2) in a column or staggered column covering a total distance of 300 to 500 yards. Total length of this serial would be approximately 1500 to 2400 yards. Total number of vehicles in this serial would be 18. Total number of serials in a battalion task force would be approximately 5 to 7. Camp Shelby regulations specify that an advance and trail wheeled vehicle must travel with each serial in excess of 4 total vehicles to provide early warning to all civilian traffic.

(D) Conduct a passage of lines -- In most cases, a battalion will conduct a passage of lines through a stationary defending friendly force to deploy into a combat formation to continue the attack. The passage of lines will be conducted on multiple routes as designated in the units order.

(E) Move tactically -- A battalion will transition from a tactical road march into a battle formation within the attack zone upon completing the passage of lines. The attack zone for a battalion is typically 2 to 4 miles in width. Length of the attack zone and the type battle formation used is dependant upon the factors of mission, enemy, time, terrain and troops available (METT-T). Typically, a battalion battle formation will have a frontage coverage of 2 to 4 miles. Typically the depth is approximately 2 miles but may vary depending upon the logistical and support trail. The development of maneuver corridors capable of sustaining this type of movement is an important aspect of the Proposed Training Areas associated with the action alternatives (i.e., Alternatives 1, 2, 3A and 3B) in this EIS. The duration will be dependent upon the type mission and number of routes, however, in a training environment a 3 to 6 hour operation is fairly typical.

(F) Breach defended obstacles -- Breaching an enemy prepared obstacle involves the battalion establishing company size sub-element responsibilities to conduct the breach, provide security for the breach element and designating the sub-element responsible for conducting the assault on the enemy. Obstacles to this movement include but are not limited to simulated minefields, wire entanglements, and tank ditches. This obstacle is overwatched by a typically smaller enemy (i.e., the defense force whose mission is described in the following section) who utilize the obstacle as a delaying factor to enable them to defeat the larger attacking force. Duration of time for this event is about 45 minutes.

(G) Assault -- tank and infantry units, in concert with the battalion operational plan, attempt to take the designated objective by destroying the enemy's ability to maintain an effective defense. This will be conducted using the Multiple Integrated Laser Engagement System (MILES) and pyrotechnic simulators to add realism to the training being conducted. This phase of the training scenario is typified by offroad maneuver across country. A company size combat formation typically consists of 14 to 18 combat vehicles organized and arrayed across the terrain. Typical formations consist of the line and wedge. A line formation description would involve 14 combat vehicles (M1A1, M2A2) approximately on line, dispersed from 50 to 100 yards apart depending upon the available terrain. In most cases no wheeled vehicles will be part of this formation. Training evaluators will be located in the vicinity to determine the unit's proficiency level in the tasks being conducted.

(H) Consolidation and reorganization -- Upon completion of the assault, gaining the objective and defeating the enemy, the battalion consolidates and reorganizes on the objective by positioning combat vehicles in defensive positions, preparing for future operations, eliminating all remaining enemy resistance, evacuating casualties, processing enemy prisoners of war (EPWs), cross leveling supplies, filling leadership positions and reporting requirements for additional logistical support. Typical duration for this event is one hour.

(2) Conduct defense in sector: Collective tasks may include but are not limited to the following. Overall duration of this type exercise is approximately 36 to 48 hours. It is normally conducted, at the battalion level, in conjunction with training in attack, as discussed above.

(A) Initial tactical road march -- This tactical road march involves movement of all organic vehicles from the Cantonment Area to a bivouac site. A battalion level road march will be approximately 13 miles in length consisting of 191 assorted vehicles. At 20 miles per hour it requires 98 minutes for all parts of the convoy to pass a given point. The movement is conducted in sections with 10 minute intervals between each section. This is in all respects similar to that required for the unit involved in Deliberate Attack, as described above.

(B) Occupy an assembly area -- Occupying an assembly area involves the battalion entering a coil formation, 360 degree perimeter, in an area approximately 3 miles square. Standard occupation time is 45 minutes. Armored vehicles will be started at intermittent intervals with primary traffic consisting of wheeled support vehicles. Duration of time spent in the assembly area will normally not exceed 24 hours. During this time units resupply, perform maintenance and rest, again similar to that performed by the unit(s) involved in the attack phase of the training problem.

(C) Tactical road march -- This tactical road march involves movement of all organic vehicles from the bivouac site to the defensive position. This road march may be conducted along several routes. The length and duration of the march will be dependent on each specific operations order and the number of routes designated.

(D) Defend -- The battalion occupies defensive positions, prepares alternate defensive positions and subsequent defensive positions to form a defense in depth. Typical defensive sector is 3 to 4 miles in width and 4 to 5 miles in depth but will vary depending upon mission requirements. Obstacles are either constructed or simulated, and will include simulated minefields (50 feet by 200 feet each), wire entanglements (50 feet by 200 feet) and tank ditches (30 feet by 200 feet). Fighting (defilade) positions for tanks are dug into the ground so that only the turret tops are exposed to enemy fires. Fighting positions for vehicles are approximately 25 feet wide, 30 to 40 feet long and vary in depth from 4 to 8 feet depending upon the terrain and vehicle to use the position. A total of 58 to 67 fighting positions are required. Specific duration of time for this event is dependant upon the unit commander, the mission and the enemy but will not normally exceed 48 hours.

(E) Cover a passage of lines -- In most cases, a battalion will cover a passage of lines by withdrawing a friendly force through the defensive positions the battalion has built. At this time the defending battalion takes charge and conducts its defense mission. The withdrawal of the passing force will be conducted on multiple routes as designated in the unit's orders.

(F) Withdraw under enemy pressure, delay, counter attack -- The battalion utilizes the withdrawal, delay or counter attack to achieve the objectives of the order. Withdrawal or delay involves the battalion or sub-elements falling back to subsequent positions under enemy contact to prolong the fight and deplete the enemies capability to continue the attack. The counter attack involves the battalion or sub-elements intermittently conducting an offensive type operation to achieve local success. This is conducted over the same area specified for the defense. Duration of this event is dependent upon the overall mission and time afforded the commander, but is typically one to several hours.

(G) Consolidation and reorganization -- Upon completion of the defense, maintaining the battle position or sector and defeating the enemy, the battalion consolidates and

reorganizes on the battle position objective by re-positioning combat vehicles in defensive positions, preparing for future operations, eliminating all remaining enemy resistance, evacuating casualties, processing EPWs, cross leveling supplies, filling leadership positions and reporting requirements for additional logistical support. Typical duration for this event is 1 hour.

Exercises During Inactive Duty Training (IDT): IDT collective training events at Camp Shelby consist of the same type of training events typically conducted during annual training (AT). The two sets of activities differ in the manner in which they are executed, the emphasis on particular skills, and the level of training, i.e., the size of the unit participating. Whereas Annual Training is conducted as a continuous operation for 9 to 12 days, IDT events are conducted over a 3 day period, typically no more than 48 to 50 hours of elapsed time.

(1) IDT Weekend Training: The conduct of training for an armor or mechanized unit while on a typical IDT weekend will follow these major steps:

(A) Advance detachment -- Arrives on the Wednesday prior to the scheduled training period, and completes the following tasks in preparation for the arrival of the full unit: (i) draw and service equipment; (ii) draw and set up training facilities and training areas which will be used; (iii) draw training aids necessary for conduct of planned training; (iv) draw administrative support and cantonment facilities required.

(B) Main body arrival -- Typically takes place on Friday between 1800 and 2400 hours (6 p.m. to midnight), depending upon the road distance from their home station to Camp Shelby. The training plan may call for deployment to the field either Friday night or Saturday morning. If the training plan calls for field maneuver actions, the following activities, similar in concept to those described above for Annual Training, are considered typical assignments. They differ from AT tasks described in Section 1.2.8.1.2 (1) (A through H) primarily in the size of the units participating. IDT exercises will almost always be carried out at the company or platoon level, with the following numbers of personnel and equipment.

(i) Company level exercise -- A company level exercise theoretically requires the use of a land area approximately 1.5 miles by 4 miles. The following types and quantities of equipment and personnel are typical in an armor and mechanized infantry company, but do not exactly represent any one unit: 140 personnel; 24 armored vehicles, including 13 M1A1 tanks; 30 wheeled vehicles.

(ii) Platoon level exercise -- A platoon level exercise theoretically requires the use of a land area approximately 0.4 miles by 2 miles. The following types and quantities of equipment and personnel are typical in an armor and mechanized infantry platoon, but do not exactly represent any one unit: 25 personnel; 4 armored vehicles, including 3 M1A1 tanks; 5 wheeled vehicles.

(C) Initial tactical road march -- A tactical road march involves movement of all organic vehicles from the Cantonment Area to a bivouac site. The initial tactical road march may occur during day or night depending on mission requirements and would be conducted on all major road networks leading to and from the maneuver training areas.

(D) Occupy an assembly area -- Occupying an assembly area involves the company entering a coil formation, 360 degree perimeter, in an area approximately one-half mile square. During this time units conduct command and control tasks, resupply of fuel and ammunition, perform maintenance, feed the troops, and rest. Feeding troops involves establishing a mobile field kitchen and feeding operation. Field sanitation (latrines) would be supplied in the maneuver training areas by contract and coordinated by the using unit and Camp Shelby training site.

(E) Second tactical road march -- This tactical road march involves movement of all vehicles from the bivouac site to the line of departure. The length and duration of the march will be dependent on each specific operations order and the number of routes designated. All vehicles are typically dispersed 50 to 100 yards apart depending upon the dust conditions created by the road march and would be conducted on the existing road network leading to and from the maneuver training areas. The lead platoon will consist of four combat vehicles (M1A1, M2A2, M3A2) in a column or staggered column covering a total distance of approximately 300 to 500 yards. The second element, the unit command section, would follow at approximately 50 to 100 yard interval and would consist of one combat vehicle. Camp Shelby regulations specify that an advance and trail wheeled vehicle will travel with each group in excess of four total vehicles to provide early warning to all civilian traffic.

(F) Conduct a passage of lines -- In most cases, a company will conduct a passage of lines through a stationary defending friendly force to deploy into a combat formation to continue the attack. The passage of lines will be conducted on multiple routes as designated in the units order.

(G) Move tactically -- A company will transition from a tactical road march into a battle formation within the attack zone upon completing the passage of lines. The attack zone for a company is typically one-half to one mile in width. Length of the attack zone and the type battle formation used is dependant upon the factors of mission, enemy, time, terrain and troops available. The duration will be dependent upon the type mission and number of routes, however, in a training environment a 1 to 2 hour operation is fairly typical.

(H) Breach defended obstacles -- Breaching an enemy prepared obstacle involves establishing company size sub-element responsibilities to conduct the breach, providing security for the breach element and designating the sub-element responsible for conducting the assault on the enemy. Obstacles to this movement include, but are not limited to, simulated minefields, wire entanglements, and tank ditches. This obstacle is overwatched by a typically smaller enemy who utilize the obstacle as a delaying factor to enable them to defeat the larger attacking force. Duration of time for this event is about 45 minutes.

(I) Assault -- Tank and Bradley units, in concert with the operational plan, attempt to take the designated objective by destroying the enemy's ability to maintain an effective defense. This will be conducted using Multiple Integrated Laser Engagement System (MILES) and pyrotechnic simulators to add realism to the training being conducted. This phase of the training scenario is typified by offroad maneuver across country. A company size combat formation typically consists of 14 to 18 combat vehicles organized and arrayed across the terrain. Typical formations consist of the line and wedge. A line formation description would involve 14 combat vehicles (M1A1, M2A2) approximately on line, dispersed from 50 to 100 yards apart depending upon the available terrain. In most cases no wheeled vehicles will be part of this formation. Training evaluators will be located in the vicinity to determine the unit's proficiency level in the tasks being conducted.

(J) Consolidation and reorganization -- Upon completion of the assault, gaining the objective and defeating the enemy, the company consolidates and reorganizes on the objective by positioning combat vehicles in defensive positions, preparing for future operations, eliminating all remaining enemy resistance, evacuating casualties, processing EPWs, cross leveling supplies, filling leadership positions and reporting requirements for additional logistical support. Typical duration for this event is one hour.

(2) IDT Defense Mission: In conjunction with the movement on offense described above, IDT field training may also involve units in defense. Activities similar to the following will be conducted.

(A) Defend -- The company occupies defensive positions, prepares alternate defensive positions and subsequent defensive positions to form a defense in depth. Typical defensive sector is one-half to one miles in width and one to one and one-half miles in depth but will vary depending upon mission requirements. Obstacles are either constructed or simulated, and will include simulated minefields (50 feet by 200 feet each), wire entanglements (50 feet by 200 feet) and tank ditches (30 feet by 200 feet). Fighting (defilade) positions for tanks are dug into the ground so that only the turret tops are exposed to enemy fires. Fighting positions for vehicles are approximately 25 feet wide, 30 to 40 feet long and vary in depth from 4 to 8 feet depending upon the terrain and vehicle to use the position. A total of 15 to 20

fighting positions are required. Specific duration of time for this event is dependant upon the unit commander, the mission and the enemy but during IDT will not normally exceed 12 hours.

(B) Cover a passage of lines -- In most cases, a company will cover a passage of lines by withdrawing a friendly force through the defensive positions the company has built. At this time the defending company takes charge and conducts its defense mission. The withdrawal of the passing force may be conducted on multiple routes as designated in the unit's orders.

1.2.8.1.3 Crew Gunnery

The training emphasis and level of training for maneuver units, regardless of whether it is conducted within annual training (AT) or inactive duty training (IDT), is qualification of gunnery crews and platoon collective validation. The training emphasis and level of training for combat support (e.g., Artillery, Air Defense, Combat Engineer, etc.) and combat service support units is company level validation. Leader training is incorporated and conducted simultaneously to validate or certify the leader's proficiency and capability to lead soldiers in various combat missions. This training is designed to ensure that leaders are prepared to train their subordinates. Validation consists of testing the unit's or leader's capability to preform wartime missions at the selected echelon or unit level (i.e., crew, squad, platoon, company, battalion or brigade). The primary training emphasis during IDT changes to individual, crew, squad, or section level and to leader training. Although some collective platoon and company training is conducted during IDT, the primary event conducted at Camp Shelby is crew gunnery qualification.

(1) Normally a unit will begin crew gunnery training with the prerequisites and preparatory training, followed by gunnery combat tables, which are conducted in three phases: basic, intermediate, and advanced.

(A) The basic phase establishes individual crew skills using subcaliber devices, dry fire, and simulators, and culminates in a TCPC or tank crew proficiency course (Crew gunnery, Table IV). At Camp Shelby, all the current live fire gunnery ranges and available training areas may be utilized for this purpose.

(B) The intermediate phase develops crew skills on crew gunnery Tables V, VI and VII, and culminates in crew gunnery qualification on crew gunnery Table VIII. At Camp Shelby only the available live fire gunnery ranges can be utilized for this training purpose due to the live fire requirement.

(C) The advanced phase develops section and platoon coordination on gunnery Tables IX and XI, and culminates with section qualification on gunnery Table X and platoon qualification on gunnery Table XII.

(2) Crew tactical tables and battle drills parallel the gunnery tables, and together they overcome the deficiencies inherent in range training. Preferably they are conducted in concert with gunnery tables.

1.2.8.1.4 Summary

Training for a modern armored brigade must replicate, as closely as possible in a peacetime environment, those conditions that may actually be encountered on a battlefield. The foundation and key principle in the Army's training doctrine specifically states "Units must train in peacetime as they will fight during war. Peacetime training must replicate battlefield conditions. All training is based upon this principle." The U.S. Army emphasizes mobility as a major tenet in AirLand Battle Doctrine. Mobility requires the maneuver space necessary to accomplish this tenet. The reserve forces of the United States, the U.S. Army Reserve and the National Guard are expected to meet the same training standards as the active component. To accomplish this goal, the appropriate maneuver space must be made available for training.

1.2.8.2 Aviation Training

1.2.8.2.1 Unit Mission and Composition

Historically, Camp Shelby has been utilized by National Guard and Reserve Aviation units. The existing facilities of Camp Shelby, for example, support Army National Guard aviation training for the 185th Aviation Group, consisting of approximately 500 troops and 42 rotary- (i.e., helicopters) and fixed-winged aircraft. The 1st Aviation Battalion, directly under the Group, is made up of a Battalion Staff, Headquarters Company, and 3 line aviation companies. The Battalion has approximately 310 people. In addition, a heavy lift company and a fixed-wing platoon report to the Battalion headquarters.

Overall Mission: The mission of this type of unit is to provide command and control, staff transportation, and target acquisition/reconnaissance aircraft to support a Corps. Among the other missions assigned to the aviation group are that of providing timely intelligence as appropriate throughout the division area, shifting reserves quickly to locations where they are needed, and the provision of other unique capabilities to be utilized as needed by the division commander.

Operational Constraints: For Army National Guard aviation units operating within Mississippi, several operational constraints to complete training realism may be identified. Primary among these is the lack of defined aviation operations areas which may be "occupied" in the field for bivouac and flight purposes. The proposed development of at least four "Tactical Aviation Areas," which is a portion of all proposed action alternatives (i.e., Alternatives 1 through 4), will largely meet this need. During present operations, as described below, it is frequently not possible to locate all aircraft and support personnel in one area, due to lack of open space with reasonable road access. As noted in the description of the aviation group, a majority of the personnel are ground support specialists, who must

drive to the training sites, establish troop food service and bivouac, aircraft maintenance and aircraft and vehicle refueling capability. The development of these aviation areas would provide suitable locations in places where they do not conflict with other military uses of Camp Shelby.

Frequency of Operations: Under all action alternatives, it is estimated that National Guard aviation use of Camp Shelby will continue approximately as at present. This is typically the conduct of one, two-week Annual Training (AT) encampment in which all personnel participate, plus approximately six weekend training exercises. These weekend exercises may be divided into those at which the entire battalion is present -- about twice a year -- and those where only one aviation company trains -- about four times per year.

- Battalion Level Exercise: A battalion level (in this case, Aviation Group Level) training exercise utilizes all the aircraft and personnel belonging to the aviation group, and performing a mix of all mission essential tasks assigned to such units. An exercise of this magnitude is normally conducted only during the two-week Annual Training encampment. The battalion may assemble for approximately two additional weekends during the year, but the number and type of tasks performed will be much smaller than presented here.

  The typical number of aircraft available to group and number normally utilized are:

Battalion plus CH-47D from Group		
A Company - 15 UH-1H available	12	go to AT
B Company - 15 UH-1H available	12	go to AT
C Company - 15 OH-58A available	13	go to AT
Fixed Wing Platoon - 5 U-21 airplanes	5	
	42	
G Company (CH-47D) 5 available	4	go to AT

	46	
+8 Added Ch-47D's (16 ship Company)		

Total A/C	54	

  The typical number of aircraft movements during battalion size Annual Training are:

  Normal takeoffs/landings per day from one site:

Single ship	UH-1H	70	Movements
	OH-58	50	Movements

	Total	120	Movements

Multi-ship	UH-1H (4 A/C)	4	Movements
	OH-58 (4 A/C)	4	Movements

		8	Movements
Single ship	CH-47D	40	Movements

The Group has a number of vehicles including the High Mobility Multi-Wheeled Vehicle (HMMWV or, popularly, "Humvee"), 2 1/2 ton trucks and trailers, Heavy Expanded Mobility Transport Trucks (HEMTTs), water trailers, and numerous generators and other smaller equipment. The vehicles number approximately 30. G Company, (Heavy Lift), which is directly under the Group has approximately 120 people. The company presently has 5 CH-47D helicopters and is slated to have 16 aircraft. G Company has approximately 20 vehicles including 2 1/2 ton trucks and trailers, maintenance vehicles, fueling vehicles, HEMTTs, and an assortment of ground vehicles and maintenance equipment.

The 1/185th Aviation Battalion, directly under the "Group" (see discussion below under 1.2.8.2.2), is made up of a battalion staff, headquarters company, and three line aviation companies. The battalion has approximately 310 people. Aviation assets include 5 U-21 airplanes in the Fixed Wing Platoon, 15 UH-1H in Company A and Company B, and 15 OH-58A in Company C, making a total of 30 UH-1H and 15 OH-58A. The OH-58A are soon to be replaced with OH-58D aircraft. The battalion is made up of a similar assortment of trucks, trailers, and equipment. The total number of vehicles is approximately 85. Within the battalion and this number of vehicles is the AVUM (Aviation Unit Maintenance) Platoon. Many of the battalion vehicles belong to this platoon. Companies A, B, and C have fewer than five vehicles each.

1.2.8.2.2 Conduct of Typical Aviation Training Exercises

Exercises During Annual Training (AT): Described below are examples of the typical mission essential collective tasks which would be performed by companies, platoons, sections, or individual aircraft and support personnel at some time during the conduct of the aviation group's annual training encampment. As for the armor and mechanized training, these tasks are not all inclusive, nor is the description definitive, but are typical examples.

(1) Mobilize and Deploy the Group: Mobilizing and deploying this size unit encompasses calling in every member of the Group which includes mobilizing the Group and the 1/185th Battalion. The "Group" consists of the Group headquarters, the Group Staff and their workers, and G Company (CH-47D). Once mobilized, the Group would then move to an assigned location, in this case, Camp Shelby, MS. The personnel not associated with flying would be moved by ground vehicles, while the aviation companies would self-deploy by air.

(2) Conduct Receiving, Staging, and Deployment (RS&D) Operations: This involves setting up shop in a predetermined location and begin to receive missions from higher headquarters. The predetermined location is generally Hagler Army Airfield, Camp Shelby, MS. However, this predetermined location, as stated in the Operation Order (OPORD) can also be a tactical site. These missions are then sorted and sent to the line units, either G Company (Heavy) or the Battalion. These missions are extremely varied, and, collectively, represent the majority of training tasks conducted. They include but are not limited to:

(A) Aerial observation -- involves flying over designated terrain, as stated in the mission, and observe the actions of the unit that is being supported. This may be as simple as flying over a convoy and watching for obstructions that may be in front of the convoy.

(B) Aerial reconnaissance -- involves looking at specific sites or location for specific problems with the site (enemy situation, obstructions, terrain descriptions, etc.).

(C) Aerial insertions and recoveries -- transport troops to known location and recover personnel from pickup sites.

(D) Flying downed aircraft missions -- involves flying over terrain to try and find simulated or real downed aircraft.

(E) Spotting for artillery units -- involves flying in a safe environment away from either the shooter or the area the round is to land. Talks to shooting unit or Range Control to know when the round is being fired and where it is supposed to land. Advises the unit on which way to adjust fire so the round will land closer to a known position.

(F) Transportation of equipment and personnel -- similar to aerial insertions, except these may be administrative type missions. Involves carrying any and all assigned loads and people to a known location.

(G) Night vision goggle missions (NVG) -- involves night flying missions without the aid of lights. Personnel will be wearing goggles which enable the personnel to see in periods of darkness without the aid of external light sources. These missions are flown at altitudes of 200 feet above ground level (AGL) and lower. Due to the adverse impact of light on the goggles, NVG flights are always done so as to avoid any built up areas or people. Built up areas always have outside lighting, street lights, security lights, night lights, etc., which cause the goggles to shut down.

(H) Nap of the earth (NOE) missions -- done at tree-top level or lower. These missions, too, are flown in areas away from inhabited areas, due to the potential for noise problems. Due to safety considerations, these are always flown on one of three designated routes which avoid hazards and people.

(I) Airplane missions -- are flown from permanent, improved airports, of which Hagler Army Airfield is one. These missions are normally administrative "people-hauling" missions done at higher altitudes and in normal airplane flying areas. They may involve single- or multi-engine aircraft up to C-130 in size when the Air National Guard is participating.

(J) External load missions -- performed with both UH-1 and CH-47 aircraft, consist of rigging a variety of loads that are to be transported by the helicopter while attached under the aircraft. The loads vary in weight and size according to the type of helicopter moving the load. This mission, likewise, avoids built up areas with people due to safety considerations. For this reason, working external loads in a tactical area affords the opportunity to maximize the training period without having to be concerned with built up areas.

(K) Refueling operations (including "hot" refueling) -- Refueling operations varies from refueling aircraft from trucks with the aircraft shut down to refueling the aircraft with it still running. The size of the operation varies from one truck to trailers with multiple hoses attached. "Cold" refueling means the truck goes to the aircraft, while "Hot" refueling means the aircraft goes to the truck, with the aircraft engine still operating.

(3) Command and Control the Force: The group, once on site, commands the activities of all of its units. This includes transmittal of messages, controlling personnel activities, controlling movement of each of its units, and maintaining security for each unit.

(4) Occupy and Secure Tactical Assembly areas: The Group would be given the mission of locating somewhere within the tactical area, including where the Battalion would also be located. Once assigned this mission, the personnel, vehicles, and all equipment must be either ground transported or air lifted. Once at the tactical site, security must be maintained against hostile forces. At any installation, this would require manning defensive positions. While in these areas, the unit will bivouac for periods of less than 24 hours to several days. This will include arriving in the area, setting up tents for living quarters, setting up areas for personnel to be fed and maintained. Perimeters are maintained in practice for war-time environment, including limited amounts of flares, smoke grenades, and possibly "blank" ammunition. During all AT periods, the Group, G Company, and Battalion will be required to move from one location to another. This involves movement of all equipment, personnel, and vehicles. This movement is normally planned to take place at least once during daylight hours and once again during darkness. Refueling operations, tents, vehicles, and everything is packed up and moved

to another location and set up again. It is to enable full performance of this type of training task that specific Tactical Aviation Areas are proposed to be developed at Camp Shelby (see Section 1.3.5).

(5) Provide Aviation Support: The full task is described as providing support to the Corps' Close, Deep and Rear Operations in varied terrain and climatic conditions during day and night operations. This includes providing any sort of aviation support requested (less attack missions). The missions are as stated in (2) above.

(6) Establish and Operate the Corps' Instrument Airfield: In each case, the Group has the mission of maintaining an airfield, whether this is Hagler Field (fixed at Camp Shelby) or setting up an airfield somewhere in the tactical area. This would include an operations area, tower facilities of some sort, and refueling operations.

(7) Supply and Maintain Aviation Operations: This includes maintenance of aircraft and refueling. In many cases, more than one refueling operation occurs at the same time. In many cases, the refueling operations is augmented by setting up a remote site from the main refueling site. This is done from trucks, either setting up a foward arming refueling point (FARP) by simply prepositioning a fuel truck.

(8) Conduct Battlefield Personnel Administration: This involves mainly practicing administrative paperwork for replacement of personnel, promotions, retirements, etc.

(9) Conduct Operations Security: A network of securing information plus securing the radio traffic with encryption equipment for radio transmissions.

(10) Conduct Operations in a Nuclear, Biological and Chemical (NBC) Environment: Although this comprises a large portion of overall training, this training is primarily in proper wear and knowledge of NBC equipment.

<u>Exercises During Weekend Training</u>:

The following summary is presented for one aviation company during a weekend training exercise. The numbers of aircraft and flight operations are representative, but not definitive for any particular unit.

Typical Movement of Aircraft Inactive Duty Training (IDT) Company Size

(1) Normally done one company at a time for 2-3 days. Approximately four weekends per year, company size elements utilize the training areas.

(2) Typically, a 15 aircraft company goes to Camp Shelby with 10-12 aircraft. The company would arrive at Hagler Army Airfield on Friday afternoon or Friday night and tiedown most of the aircraft. There typically will be 5-8 aircraft continuing to fly after the initial landing of the company. The types of missions will be similar to those described above for Annual Training, although only a few will be undertaken by any one company in one weekend. Missions: administrative flights; night flights; NOE flights; NVG flights; support missions; movements - external/internal (passenger); troop insertions/extractions; formation flights; contour flights; low level flights; formation flights.

The typical number of flight movements, one company on weekend training are:

Flights from Hagler Field	12 Landings
	8 Secondary movements
	20 Total movements

Saturday -- Most aircraft will fly during the day moving to a field environment, followed by continual training.

	12 Takeoffs (Hagler)
	12 Landings (Field)
	40 Additional Movements
	64** Total Movements

** 52 of these movements would be at the same field site.

Sunday -- Normally a limited number of movements, due to preparation for movement from field.

	30 Movements (Preparation for Leaving)
	12 Takeoffs for Movement to Home Station
	42 Total Movements

(3) Altitudes within the Tactical Training Area are below 200 foot AGL during tactical training. Landings and takeoffs from tactical sites will be below 200 foot AGL.

(4) There will be some 10 percent of this same flying that will be above 200 foot AGL. These are for evaluator flights, search and rescue for NOE flights, actual medical evacuation (MEDEVAC) flights, and administrative flights.

1.2.9 Alternatives Considered but Rejected

Continue Operations Using only State-Owned and Department of Defense-Owned Land: This land consists primarily of the current Cantonment Area. Under this alternative, approximately 14,400 acres owned in fee by the Department of the Army (DA) and the State of Mississippi would remain in operation as a school activity, conducting primarily classroom training. This alternative was rejected because it could not meet the current mission requirements for the units assigned to Camp Shelby. While certain uses might eventually be found for the facilities, there is no identifiable requirement for a facility of this type in present Army or National Guard school and force structure. Thus, there is no definition or description available of a proposed use upon which environmental analysis may be prepared. Without such a definition, this variation becomes equivalent to Alternative 6, i.e., close Camp Shelby.

Acquire Land South and West of Current Boundaries: Land south and west of the current boundaries of Camp Shelby would be very suitable for the military uses contemplated. This land consists of a mix of National Forest and privately owned property, with much more private property than within the present special use permit (SUP) area (see Figure 1-3). Both the capital and social costs for acquiring this property, however, were determined to be prohibitive. Thus, this alternative was rejected as not being a practical means to achieve the proposed objectives.

Utilization of Camp McCain: Camp McCain, Grenada, MS, a weekend training site of approximately 7,400 acres, now provides 15 to 20 percent 26
of the Mississippi Army National Guard training requirement, and is considered fully utilized. This analysis takes into consideration the ongoing land acquisition program at Camp McCain (approximately 5,800 acres in FY94). This program is intended to improve the quality of training and will not accommodate additional equipment or units. Thus, this alternative was rejected as not being capable of achieving the proposed objectives.

Use of Other Facilities: A survey conducted by the Defense Training and Performance Data Center in Orlando, Florida indicated that the nearest facility capable of providing the training facilities comparable to Camp Shelby is Fort Polk, Louisiana. As this site is used on a regular basis by the active army components, additional utilization opportunities are not available. The utilization of distant training sites, i.e., the National Training Center at Fort Irwin, CA, requires a great amount of funding and reduces training time. Utilization of distant training sites would drastically reduce the number of training opportunities, therefore causing a reduction in the mission readiness. Future funding is being reduced. We have to do more with less. This amplifies the importance of Camp Shelby, MS.

Alternate Training Areas: The evaluation of alternative sites has established that there are no cost effective sites that will meet the mission and need requirements now provided by Camp Shelby.

(1) The evaluation is based upon several assumptions outlined below:

(A) The force structure of the MS Army National Guard (ARNG) and other Reserve Component (RC) units in the region of Camp Shelby will continue to include armor, mechanized infantry, artillery, engineer and aviation and other heavy maneuver units.

(B) The RC forces regional to Camp Shelby will continue to require a regional training site to accommodate weekend annual training (AT) and mobilization within commuting distance.

(C) Camp Shelby will continue to be designated as a U.S. Forces Command (FORSCOM) mobilization station for RC units.

(D) Funds available to the National Guard to support training are being substantially reduced and will not support transportation and relocation of personnel and equipment to distant training sites.

(E) RC units will train with their own equipment that they are expected to mobilize and fight with.

(2) Alternate sites:

(A) The only alternate site with adequate facilities and training resources to fully support the MS armored brigade is Ft. Hood, Texas. Limited range and training areas are also available at Ft. Polk, Louisiana.

(B) The cost of transportation to move personnel and equipment to Ft. Hood is a major factor involved in using Ft. Hood (Estimated Cost: $3,000,000 per brigade, per movement[4]) The travel time required to move to Ft. Hood will reduce available training time to unacceptable parameters. The cost associated with movement to Fort Polk are somewhat less than for Fort Hood, however, still preclude consideration because of limited funding and training time available.

(C) The current forces that train at Ft. Hood, Texas reach or exceed the maximum capability of the installation at any given time.

(D) The construction of an alternate site at some other federal installation to replicate what exists at Camp Shelby is cost and resource prohibitive.

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[4] Estimated Cost: By way of example, during Operation Desert Storm, the actual cost to convoy 960 wheeled vehicles and ship other equipment by rail was in excess of 3 million dollars. This can be used to estimate annual movement cost even if it is accomplished in several events throughout the year.

(E) There are no installations that replicate the Camp Shelby capability to support field artillery units. Camp Shelby has 114 artillery firing points that will support the simultaneous training of two artillery brigades with up to six artillery battalions. Other installations can support field artillery on a limited basis.

1.3 Description of Proposed Training Facilities

The following individual facilities projects are associated with one or more of the proposed action alternatives, i.e., Alternatives 1, 2, 3A, 3B, 4 and 5, in which field training activities of varying types are to be continued. Preferred and alternative locations of each of these facilities is shown in Figure 1-18. These facilities are those not evaluated in detail in the *Training Facilities EIS*, either because they were not presented there or were mentioned in that document, but with a statement that detailed examination would be deferred to this study. None of these proposed projects duplicate those discussed in Section 1.1.5. Of these facilities, only the Tank Table VIII project is described with enough detail necessary for this to be the final decision document. The other Operational Area training facilities, the Multiple Purpose Range Complex-Heavy (Section 1.3.2), the Tactical Aviation Training Areas (Section 1.3.5), and the CALFEX Assembly Areas (Section 1.3.6), may require site specific environmental analysis (Section 1.5). These training facilities are viewed as reasonably foreseeable actions and their effects are examined in Section 3.5 on cumulative effects.

1.3.1 Proposed Range 45 Automated Tank Table VIII (ATT-VIII) Project

ATT-VIII is the individual crew qualification table and the culmination of the intermediate phase of tank combat training. This table tests the crew's ability to safely and effectively engage moving and stationary targets with tank-mounted weapons, during daylight and periods of limited visibility (e.g., night, fog, rain, dust). The tank crew negotiates a course engaging single, multiple and simultaneous target arrays from a moving and stationary tank (see Figure 1-19). Basic individual and crew skills are trained in preceding tank tables, simulators and exercises. The Army uses Table VIII to certify that the individual tank crew is qualified to begin collective, live-fire training at the unit (section or platoon) level. It is thus the critical transition between individual and unit proficiency.

Existing Range 45 comprises approximately 750 acres from the Grapevine Road on the west, at easting 293200, northing 3443800 and to the east side at easting 296200, northing 3444000 (see Figure 1-18). The range encompasses uplands on the west sector, bottomlands in the central section along Poplar Creek, and uplands on the east sector. The range has been used for various Tank Tables (VI, VII and VIII) for over 25 years.

The existing Range 45 was designed and constructed to fulfill the firing requirements of the M60 tank, which dates from the 1960s. The basic M60 series tank has now become obsolete due to changes in technology which resulted from changes in military doctrine described in Section 1.1.2 above. The M1A1 (Abrams) tank and M2 (Bradley) Infantry Fighting Vehicle and M60A3 tank were fielded as a result of these technological and doctrinal changes.

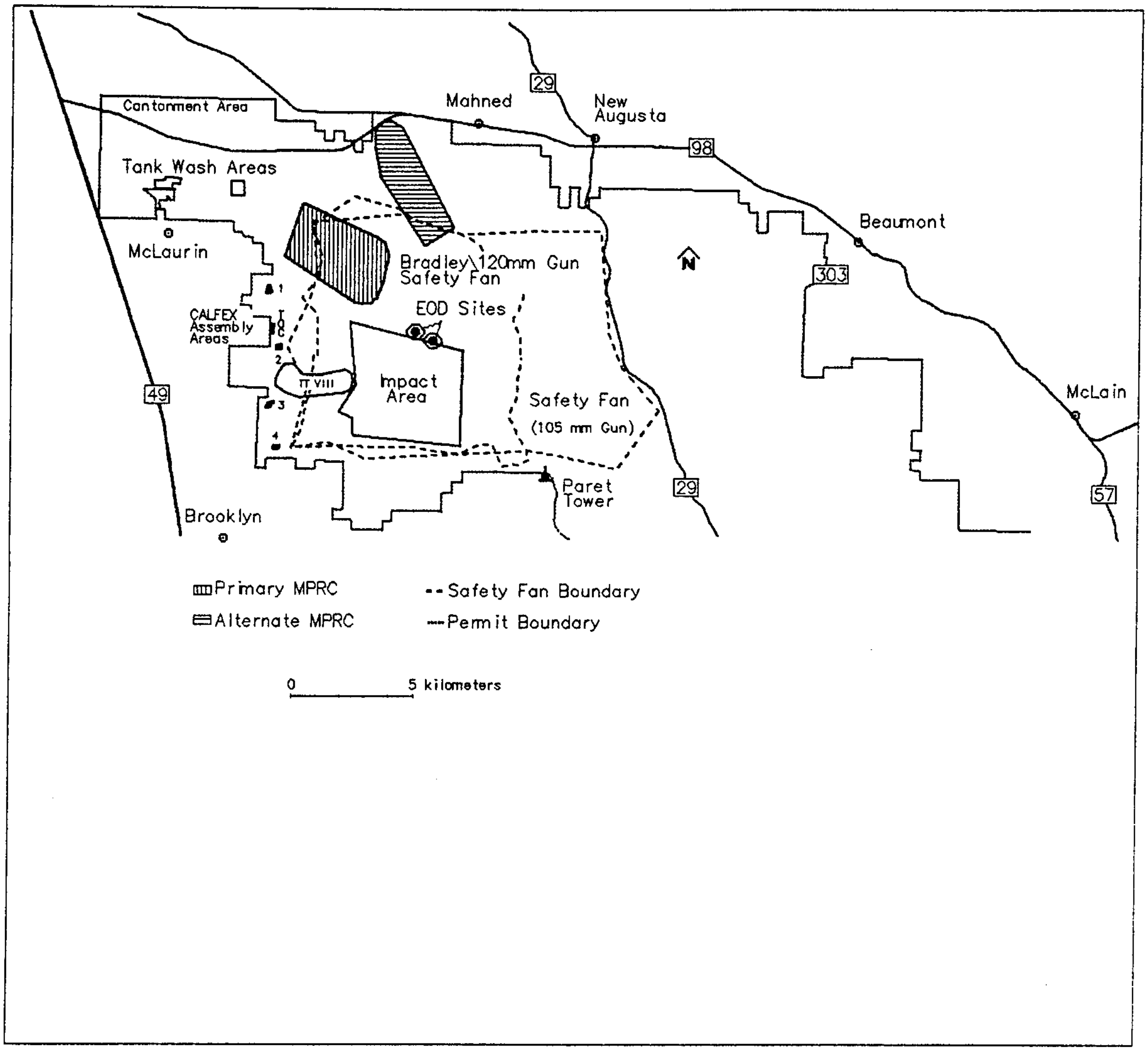

Figure 1-18 Proposed Locations for Training Facilities, except tactical aviation areas (TAAs)
Note: Safety Fans Used with Tank Table VIII Are Also Shown

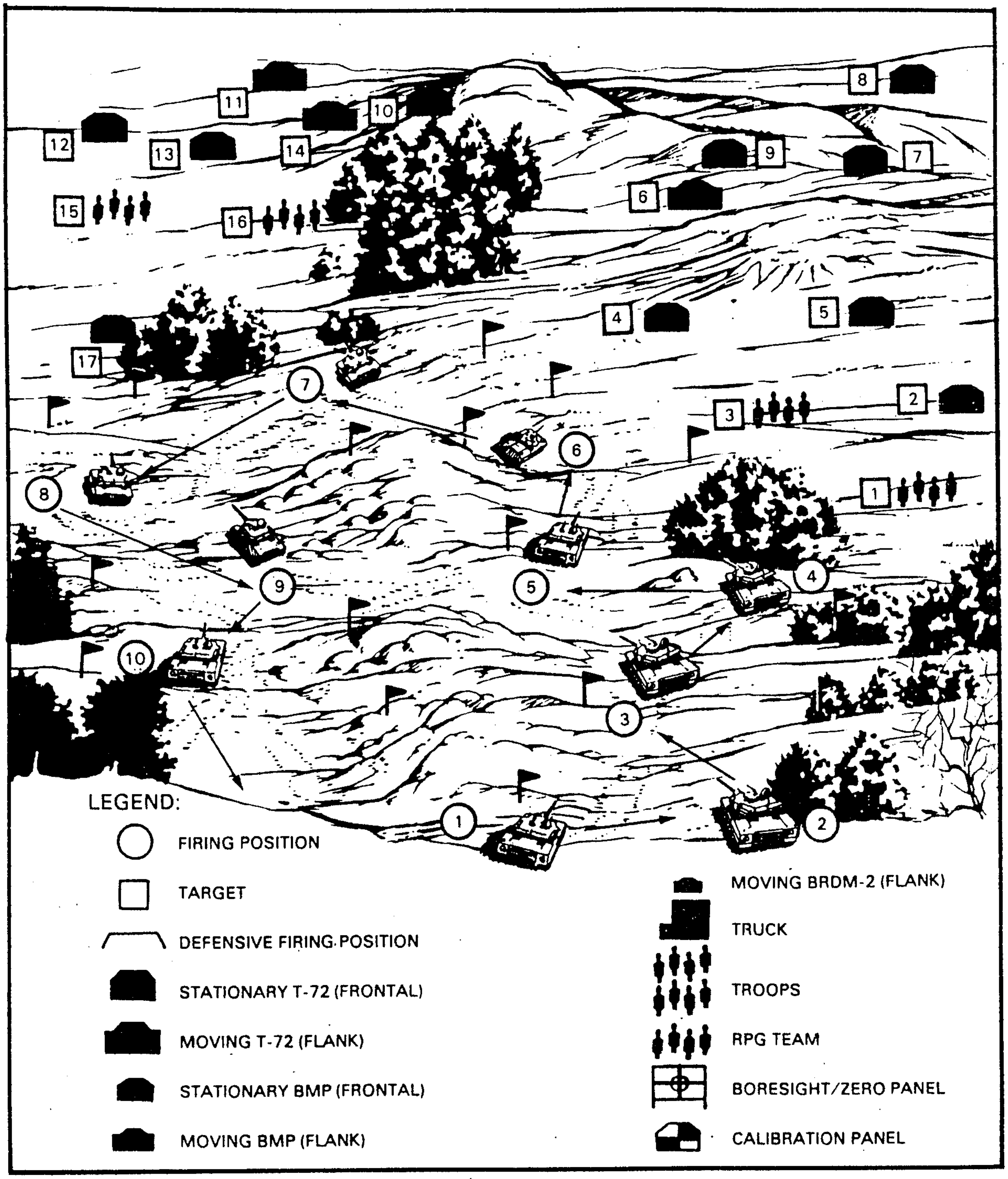

Figure 1-19 Concept of Training Use of Tank Table VIII
The T-72, BMP and BRDM are Opposing Force armored vehicles

Ranges had to be redesigned to meet these new changes (i.e., changes in targetry arrays and layout distances).

The original M60 battle tank could not fire while moving nor did it have the sophisticated target acquisition systems to range find or seek out thermal images. The Abrams tank, which has now been fielded to the National Guard, can do all of the above. Range reconfiguration, then, becomes a necessity for this vehicle to meet modern battlefield requirements. In addition, tank gunnery requirements have changed through the inception of the Abrams and Bradley into the military inventory. Range design had to change to accommodate these requirements of higher speeds and advanced target acquisition systems.

Presently, the standard range design by the Army for Tank Table VIII to meet present requirements calls for computer controlled automated targetry. This must be installed and a stabilized battle run constructed where the Abrams and Bradley can fulfill their moving firing requirements. This stabilized battle run means a graveled road must be constructed to allow Abrams, M60A3's and Bradleys to acquire, range and engage targets while moving at speeds from 15 to 40 miles per hour. The existing Range 45 cannot accommodate these requirements.

Proposed Modifications to Range 45: To upgrade the training potential of the range it is necessary to construct a staging and maintenance area (165 feet by 330 feet) containing a concrete hardstand (35 feet by 35 feet) with an adjacent open mess area (20 feet by 40 feet) and a latrine. A new staging road (Road D, Figure 1-20) approximately 30 feet wide and 1/2 mile long, will be constructed from the proposed staging/maintenance area to a proposed range control tower and an administrative/storage building (20 feet by 40 feet) area. From the control tower and administrative building, two new roads (B and C, Figure 1-20) will be constructed from which firing will occur. Road B and C will be 18 feet wide and approximately one-half mile long, and will be used as both a Stabilized Gunnery Route and a Wing Man Route, as well as an exit route from the range. The last new roadway (Road A, Figure 1-20) will be 18 feet wide and approximately one-half mile long, and will be used as a non-firing return route for vehicles completing the Stabilized Gunnery Course from Road B.

The existing Range 45 access roads will be upgraded to approximately 18 feet wide, graveled/limestoned, with necessary culverts, lead-off ditches, and on-site fill dirt in order to support tank traffic to and from the Range 45 area. A proposed concrete ammunition loading dock (20 feet by 70 feet) will be constructed adjacent to one road, 800 feet from the proposed range control tower, the staging and maintenance area, and Grapevine Road in accordance with Training Manual 9-1300-206, "Ammunition and Explosive Standards" (August, 1973). All proposed firing positions and target locations are designed so as to utilize the existing impact area and safety fans. No expansion of either is contemplated. Existing road barricade locations will be utilized during operation of the subject range and additional barricade locations will also be utilized where needed.

The Range 45 ATT VIII upgrade will basically utilize the target package contained in one lane of a Multiple Purpose Range Complex-Heavy (MPRC-H). There will be 20 stationary armor targets, 44 personnel targets, and 4 Armor moving target tracks constructed utilizing design information contained in HNDM (Huntsville Division Manual) 1110-1-6 for an MPRC-H. Target positions will be constructed and 9 existing firing positions will be

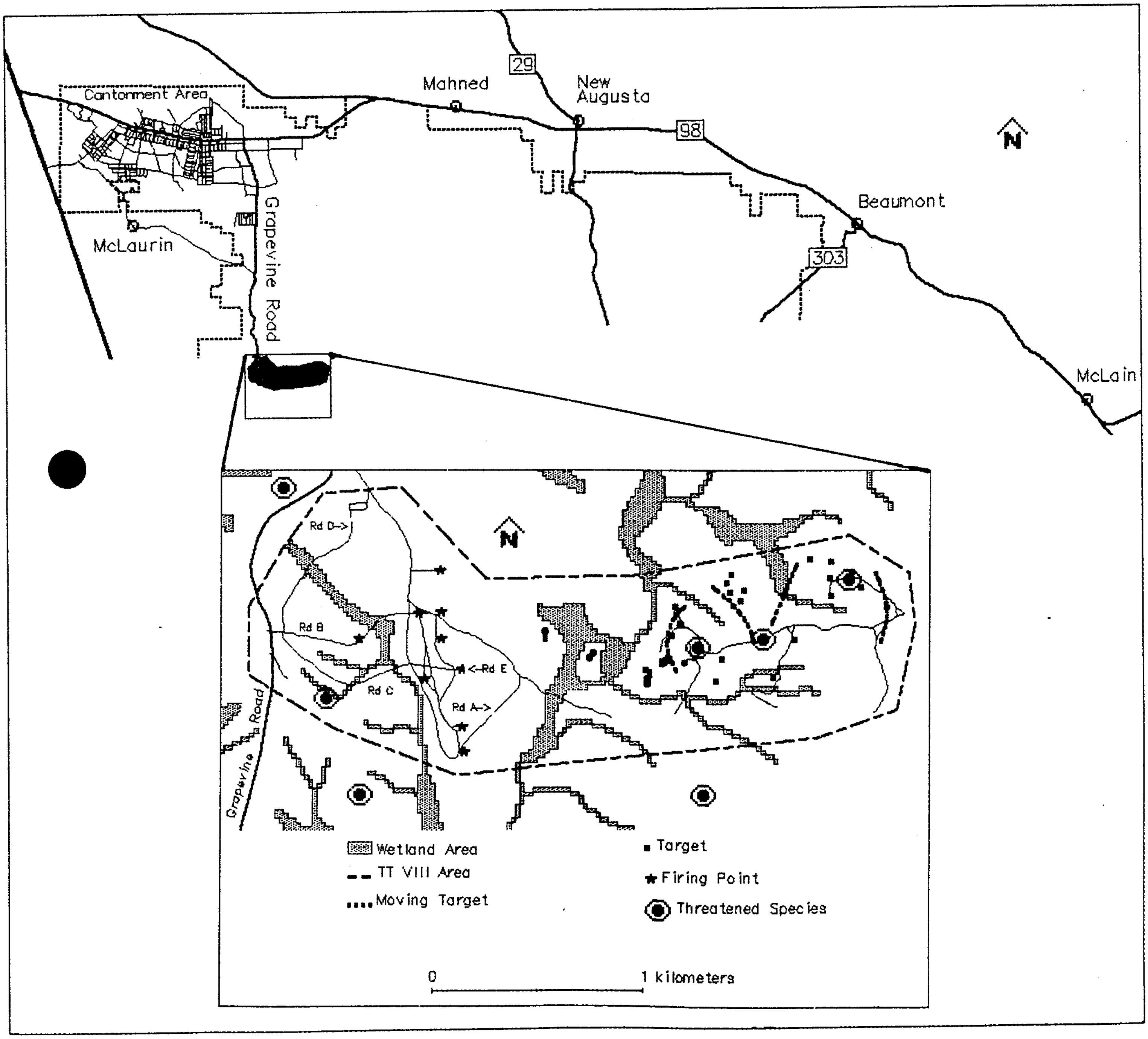

Figure 1-20 Proposed Modifications to Range 45 to Convert to Tank Table VIII

redesigned to configurations in accordance with HNDM 1110-1-6. The locations of these target arrays is shown in Figure 1-20, locations B and C. There will be power distribution and computer data cable trenched to each target from the control computer located in the proposed control tower. Erosion Control Measures outlined in the Camp Shelby Erosion Control Plan will be followed during the trenching process. It is proposed to cross Poplar Creek with this cable by means of conduit at the range 45 target area access bridge to prevent the need to trench across the creek. Existing road barricade location will be utilized during operation of the subject range and additional barricade locations will also be utilized where needed.

Alternative Location for Tank Table VIII: In keeping with the requirement to examine feasible alternatives, a search was made for locations other than the existing Range 45 where this Tank Table VIII project could be sited. The number of possible locations was very limited because of the need for the tank main gun safety fan requirements which must be maintained for purposes of public safety, including safety of military personnel and civilians using adjacent areas.

The existing tank main gun safety fan has been placed in such a way that Mississippi Highway 29 need not be closed when firing is conducted. The required setback, approximately 12 km (7 miles), leaves Highway 29 open. Due to the angles of fire possible from the west side of the impact area, a deviation of only 10 degrees from the suggested alignment would require this closure every time the range was in use. The significance of such closures is clear, and believed to be so obvious that no alternative requiring such frequent, long-term closure was considered acceptable to the Army. An alignment using firing in a north-south orientation is also theoretically possible, but the implementation of the required (approximately) 12 km safety fan would require acquisition of additional property (and/or extension of the permit area) to accommodate this. Several communities and private residences could also be within the safety fan area. This is clearly unacceptable.

A second general alternative for location of a Tank Table VIII in a different area would be to use land east of Highway 29 and USFS 303 for both firing and, theoretically, for an impact area. This orientation brings additional problems. If firing is from the east to the west, using the present impact area, then the actual firing, not just the safety fan, would cross Highway 29. If the firing and impact area were both east of Highway 29, then extensive conversion of land use from training area to range and impact area would be required. Considerable acreage now available for many types of training would become unavailable for use during firing. This would be in addition to the areas of the existing tank main gun safety fan, since other tank ranges would continue to use the present impact area. The disruptions to both Army and civilian land use and access which would result from these alternatives are considered completely unacceptable. Thus, the re-use of the existing Range 45 orientation, target area and firing fan is considered the only reasonable combination of alternatives available. Therefore, no specific alternative to the re-use of Range 45 will be examined in detail for this proposed project.

1.3.2 Proposed Multiple Purpose Range Complex-Heavy (MPRC-H)

The MPRC-H supports collective training at the small unit level. The "floor" level training requirement for maneuver units has been established at the platoon level while progressing to company and battalion task force level training. The MPRC-H provides the collective training challenge at platoon level. The lack of an MPRC-H at Camp Shelby was also noted in the Department of Defense (DoD) response to a Government Accounting Office (GAO) report. The lack of an MPRC-H is mentioned as a training shortfall. This complex allows for maneuver and gunnery (non-dud producing) on the same range. The lack of availability of this range certainly has a detrimental effect on the readiness of the units involved.

The construction of an MPRC-H is vital to the training and combat readiness of the armor and mechanized infantry units that train at Camp Shelby. There are no alternate sites within a reasonable travel distance that affords this training opportunity. The unit's equipment, i.e., M1A1 Tanks and Bradley Fighting Vehicles, are stored at Camp Shelby.

Department of the Army Pamphlet 350-38, *Standards in Weapon's Training*, establishes the weapon's qualification standards and requirements for individuals, crews and units. Armor and mechanized infantry units are required to conduct crew qualification annually. This is accomplished by firing Range Table VIII. Armor units must also maintain a "floor", minimum range facility that accommodates platoon level collective training as well as individual and crew qualification training.

The absence of an MPRC-H at Camp Shelby, in a discussion of inadequate ranges, was noted in Comments From the Department of Defense, on the GAO Report, *Peacetime Training Did Not Adequately Prepare Combat Brigades for Gulf War*, dated September 1991.
The MPRC-H provides the facilities for conducting advanced combat gunnery training and qualification. This advanced training develops collective skills at the small unit level. It requires sections and platoons to employ moving and stationary target engagement techniques with all weapons systems during daylight and periods of limited visibility. Units using the MPRC-H will include tanks, infantry/cavalry fighting vehicles and attack helicopters.

The MPRC-H is a standard Army gunnery range which has three maneuver avenues with two course roads per avenue (see Figure 1-21). Only non-dud producing (or "practice") ammunition will be fired within the target array. The range has a maximum of 270 targets which can be engaged with either live-fire or the Multiple Integrated Laser Engagement System (MILES).

The MPRC-H would allow armor and mechanized infantry units to fulfill all their gunnery requirements on an annual basis. With the completion of this range and the upgrade of Range 45 (Tank Table VIII), the potential exists for fewer requirements for firing on weekends, because more tanks can complete firing at one time, thereby reducing the tank safety fan restrictions. Two potential sites have been identified (see Figure 1-18). For the primary site,

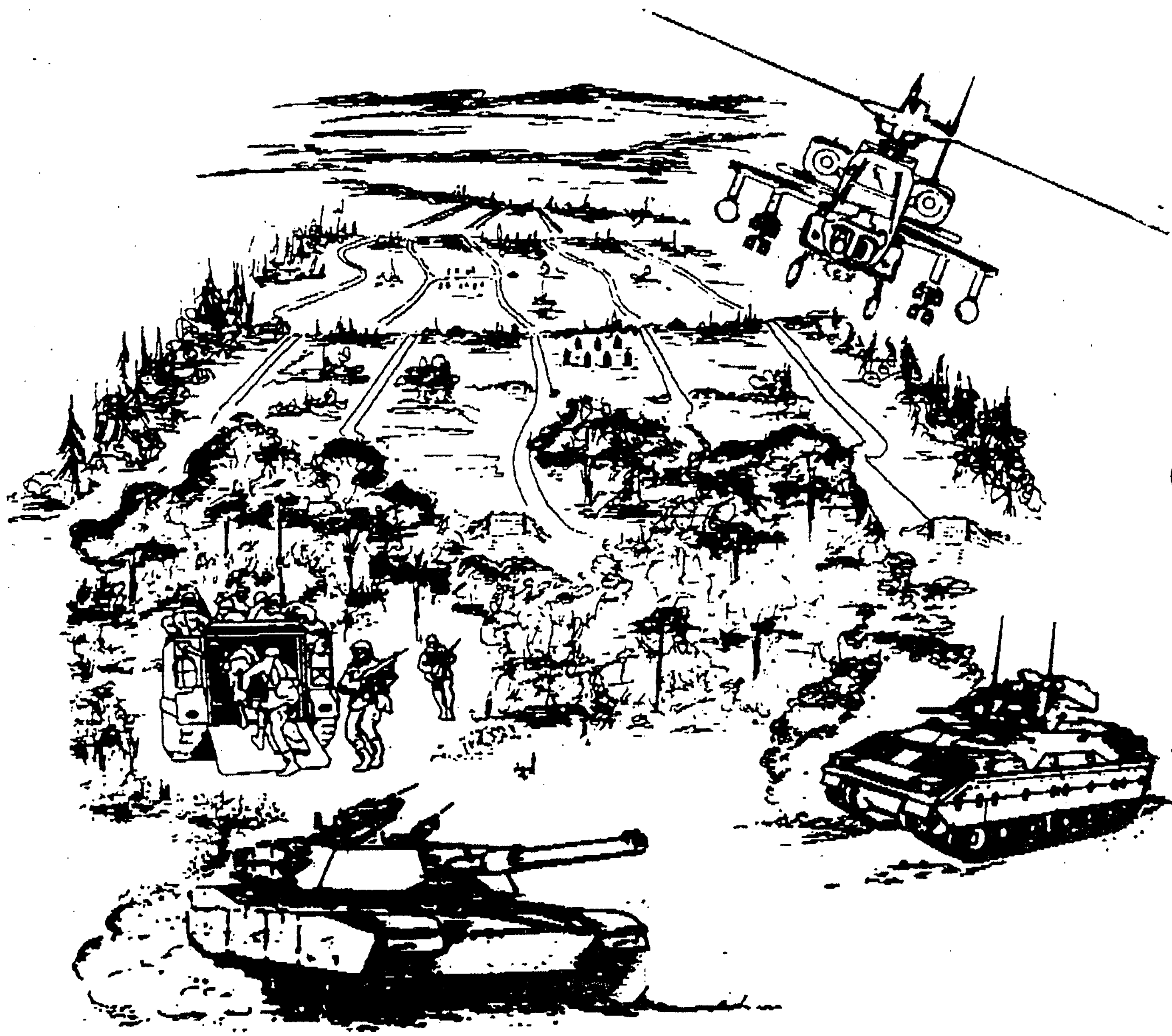

Figure 1-21 Artist's Depiction of Multipurpose Range Complex (Heavy)

the total area would encompass 2,135 acres (Figure 1-22). Of this total, 317 acres have already been cleared and 230 acres are wetlands. For the alternate site, the total area is 1,789 acres, 214 acres of which have already been cleared and 66 acres of wetlands. The proposed project would consist of the range operation and control area, the downrange area, and the vehicle holding and maintenance area. The designated wetlands would be protected in either location.

The range operation and control area is the center of responsibility for overall control and coordination of movement and training exercises within the complex, and is also the administrative center for the MPRC-H. Range support facilities in this area may include the control tower, general instruction buildings, personnel and storage buildings, target maintenance building, latrines, covered mess, covered bleachers, and Lysterbag holder. Also, an ammunition loading/unloading dock for armor munitions and an ammunition breakdown shelter for infantry should be provided (Huntsville MPRC-H Design Information Guide). Trees in this area would be thinned to allow construction of necessary roads and buildings.

The downrange area consists of three 4,500-meter by 300-meter lanes, each separated by a 50-meter buffer zone, and contains the following target and simulation devices: 4 moving armor targets, 20 stationary armor targets, 51 stationary infantry targets, 15 moving infantry targets, and 30 defilade positions. Access to target mechanisms would be provided by means of service roads to facilitate the installation and maintenance of the target mechanisms. The maneuver trails themselves would be used as much as possible. The three lanes would be cleared of all trees, while the buffer zones between lanes could remain in a natural state. The vehicle holding and maintenance area requires approximately 5,000 square meters (1 to 2 acres), sufficient area for a maneuvering and parking area for at least 17 tracked vehicles. In addition, this area would contain a 100-square-meter hardstand for maintenance purposes. This area would be cleared of all trees.

The preferred alternative location for the MPRC-H is in the existing Range 40 complex. The MPRC would be an enhancement to an existing facility. The available terrain between Range 40 and Davis Range Road allows an arrangement complying as closely as possible with the MPRC-H layout described above and prescribed by the Huntsville MPRC-H Design Guide. This firing point to target array will keep all surface danger zones inside the existing tank fan barricades.

The second alternative would be to overlay the MPRC-H lanes in the vicinity of T-19. This location is farther away from maintenance and support facilities and would require extension of the tank fan barricade structure about one mile north in the vicinity of the project.

1.3.3 Proposed Automated Tank Wash Facility

This project would consist of construction of a totally automated tank wash facility (see Figures 1-23 and 1-24). The facility will be a specially designed permanent tank wash based on the "bird bath" concept with additional support of high velocity water flow.

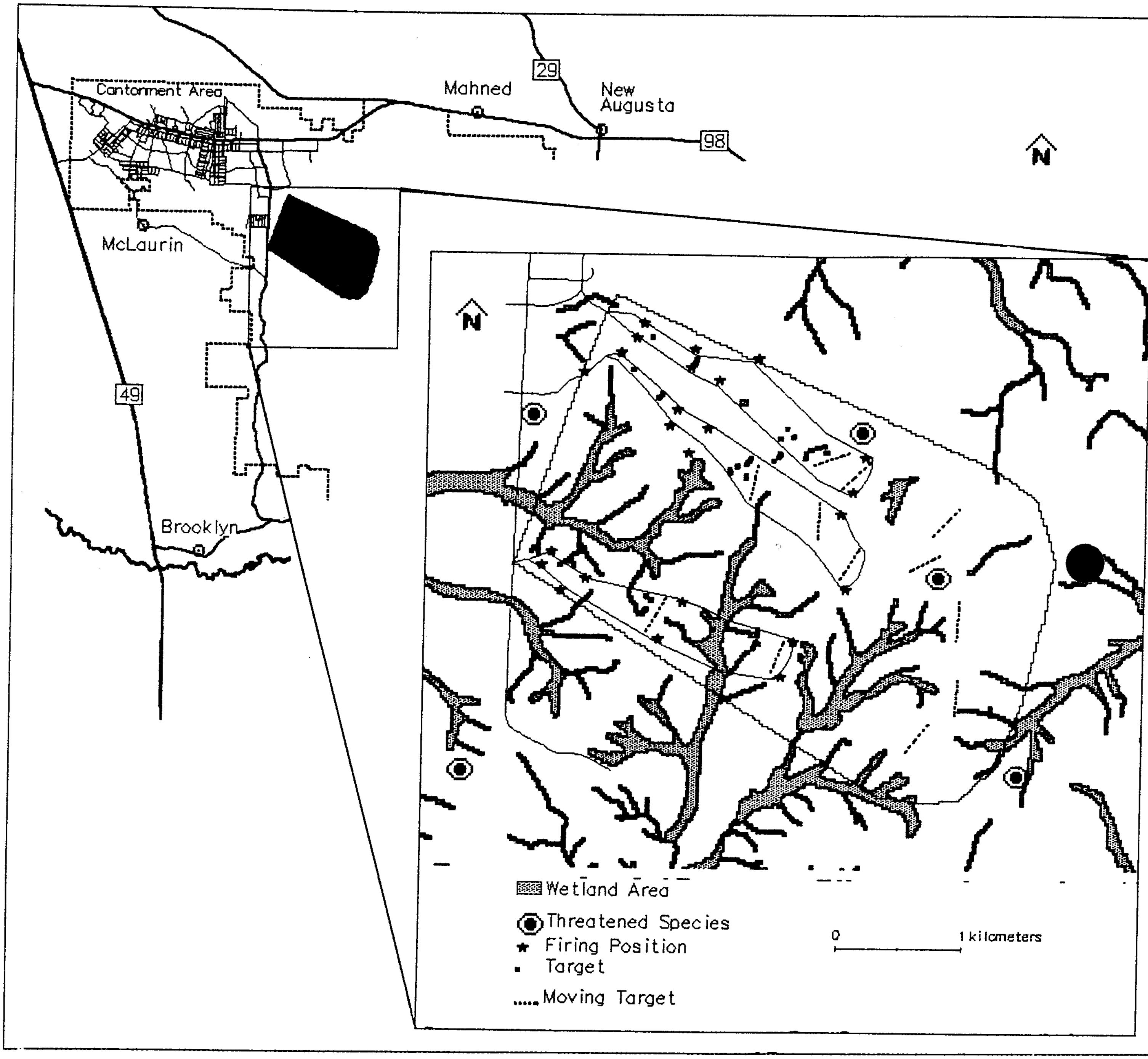

Figure 1-22 Proposed Multipurpose Range Complex (Heavy) (Primary Site)

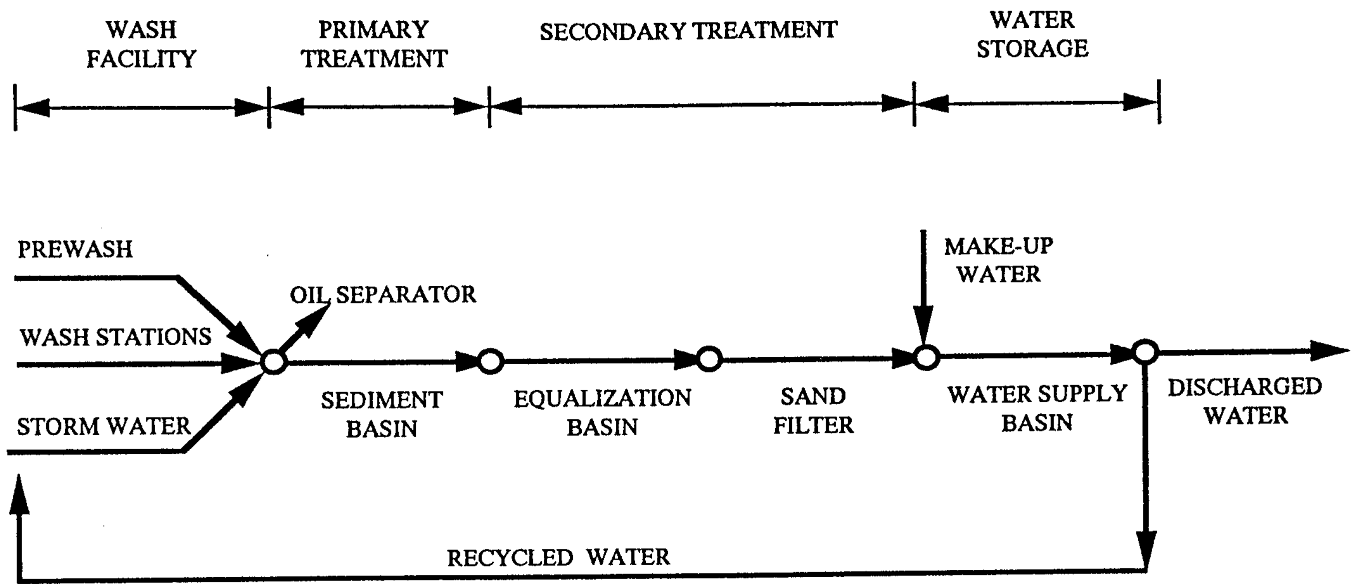

Figure 1-23 Flow Diagram for Automated Tank Wash Facility

There will be a pre-soak, high velocity, and post wash area. The project will include the construction of a water reservoir, control tower, night lighting support, sedimentation and equalization basins and sand filters. The proposed project has partial wastewater recycle and discharge and total water recycle options with the wastewater being pretreated and provides for oil separation. The discharged, treated effluent will meet National Pollutant Discharge Elimination System (NPDES) permit requirements for disposal into surface waters. Discharge into the Camp Shelby wastewater treatment plant is an alternative available if added treatment is required.

This project is required to provide a more efficient, safe and time saving facility for cleaning all types of tracked vehicles assigned to the Camp Shelby Army National Guard (ARNG) Training Site. This facility will be utilized whenever tracked vehicles return from the field. The present wash facility is a flat slab, high pressure hose operation with 96 points. The proposed facility will not only save a significant amount of unit time, but will also reduce the potential for chemical and suspended solid contamination of the effluent, including possible changes in discharge standards.

The two alternative sites, both approximately 70 acres in size, are near Davis and Hartfield Creeks (see Figure 1-18). The primary alternative is a parcel, located within the Cantonment Area and bounded by 11th and 15th Avenues on the north and south, respectively, and by 38th and 42nd Streets on the west and east, respectively. The facility itself will occupy approximately 59 acres of land on either tract. Both tracts are located on state- or Department of Defense (DoD) owned land.

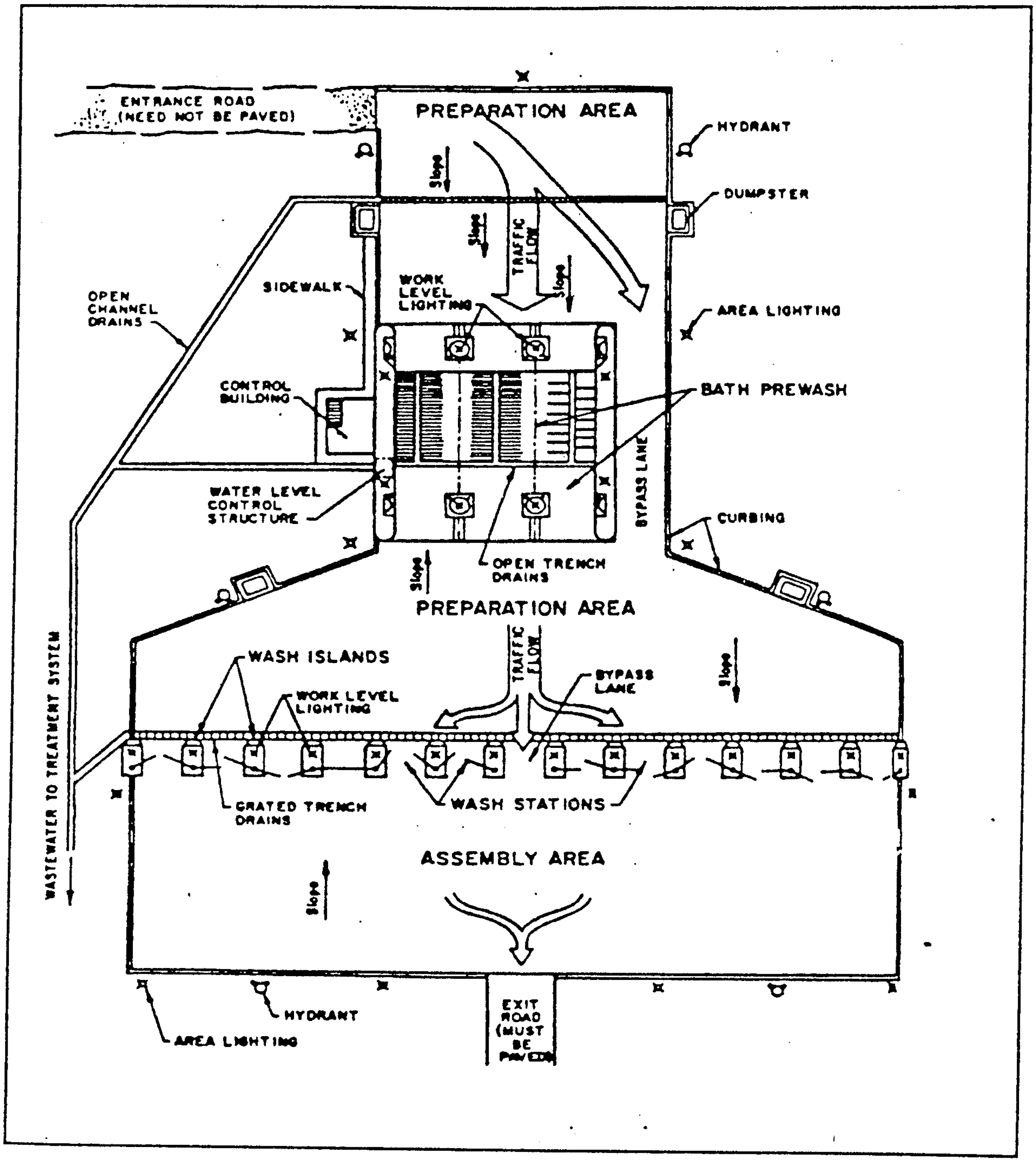

Figure 1-24 Generalized Layout of an Automated Tank Wash Facility

1.3.4 New Explosive Ordnance Disposal Facility

Explosive Ordnance Disposal (EOD) is a tenant activity at Camp Shelby under the control of Department of the Army (DA) which supports military activities in Mississippi and southern Louisiana. This activity is operated by a DA detachment of 8 persons, from Fort Sam Houston, Texas. The activity of the EOD is coordinated by the Mississippi Army National Guard (MSARNG) through the Mississippi Department of Environmental Quality, Office of Pollution Control, for emergency disposal. The mission of the EOD is to provide routine and emergency EOD support to military installations, operations, exercises and to federal and civilian authorities within its assigned geographical area. The mission also includes the neutralization of domestic or foreign manufactured ordnance and improvised explosive devices brought to the attention of local, state, and federal law enforcement officials.

The previous EOD open detonation unit is located in a used impact area. Because of its location, the Mississippi Department of Natural Resources through Administrative Order No. 1887-90 dated 11 September 1990 required that: "The existing open detonation unit shall not be utilized for disposal of hazardous waste after November 8, 1992." The facility was clean closed in compliance with the Administrative Order (see Appendix D). The primary reason for requiring closure was that the existing unit was located in a heavily used impact area where it was difficult to safely and accurately monitor soil and groundwater quality in compliance with the Resource Conservation and Recovery Act (RCRA).

The new facility proposed will meet the requirements of RCRA Regulations for Miscellaneous Units. Under the Administrative Order, "Respondents shall not commence construction of a new hazardous waste miscellaneous unit, until such time as a RCRA Permit for the unit has been issued to the owner/operator of any such facilities." To continue operation of EOD activities at Camp Shelby, a Part B permit for a new open burning/open detonation (OB/OD) unit must be obtained.

The new facility, in compliance with RCRA, will be constructed to accomplish the following:

- Define a single location as the only installation EOD area.
- Provide burn pans for open burning disposal to eliminate soil contamination. All burn ash (residue) will be tested prior to disposal to determine if it is a hazardous waste prior to disposal.
- Provide a specially designed open detonation pit to accomplish open detonation activities.
- Provide adequate security procedures.
- Provide permanent groundwater monitoring wells.
- Ensure that the location meets other RCRA requirements for miscellaneous units.

The type of ordnance disposed of in the facility will be the same as was previously processed. The EOD will receive a variety of explosive and pyrotechnic ordnance fired by units training at Camp Shelby. This will include: mortars, bombs, rockets, high explosives, mines, fuses, grenades, small arms ammunition and similar items.

Items awaiting destruction will be stored in an earth-covered bunker at the Ammunition Supply Point at Camp Shelby. In most cases, storage time will be less than thirty days.

A single disposal operation, in terms of explosive weight destroyed, will normally range from 40 pounds or less to 500 pounds. This includes the explosive charges used to perform the disposal. High explosives (C-4) or equivalent, and on occasion detonating cord, will be used to achieve destruction. Destruction charges are initiated by electric or non-electric firing systems.

An open detonation disposal operation will normally consist of one daily detonation. The maximum explosive weight for a single operation with the new facility will be limited to 500 pounds. Previously, explosive weight for individual disposal operations sometimes exceeded this level.

Two sites are identified for this facility (see Figure 1-18). Both sites will be on state- or Department of Defense-owned land and have not previously been used for firing or explosives. Criteria for sites will ensure safe operations and minimal disturbance of nearby activities such that the sites be located at least two miles from scenic rivers and that they not be located within a high-explosive impact area.

The EOD facility will consist of two areas separated by an earthen berm, as shown in Figure 1-25. (Refer also to Chapter 2, Section 2.1.2.1 for more discussion on the buffer zone.) These areas are an open burning area for disposal of propellant residue by burning and an open detonation area for disposal of explosives and pyrotechnics by detonation.

The open burning area will consist of two burn pans placed on concrete pads and provided with an ash gate and collection box at one or both ends. The burn pans will each be approximately 4 feet wide by 16 feet long, with sides at least one foot in height. Both burn pans will be equipped with grates to contain the propellant while burning and with covers to protect the pans from weather while not in use. A liner of clay, fire brick, or a castable refractory material will be used with the pans when burning high explosives or material that will produce a high heat for a long duration. The open detonation area will consist of a pit approximately 4 feet in depth and 25 feet in diameter. The ordnance to be detonated will be placed in the pit and covered with earth to a depth of at least two feet. An earthen berm approximately the height of the burn pans and concrete pads will be placed between the open

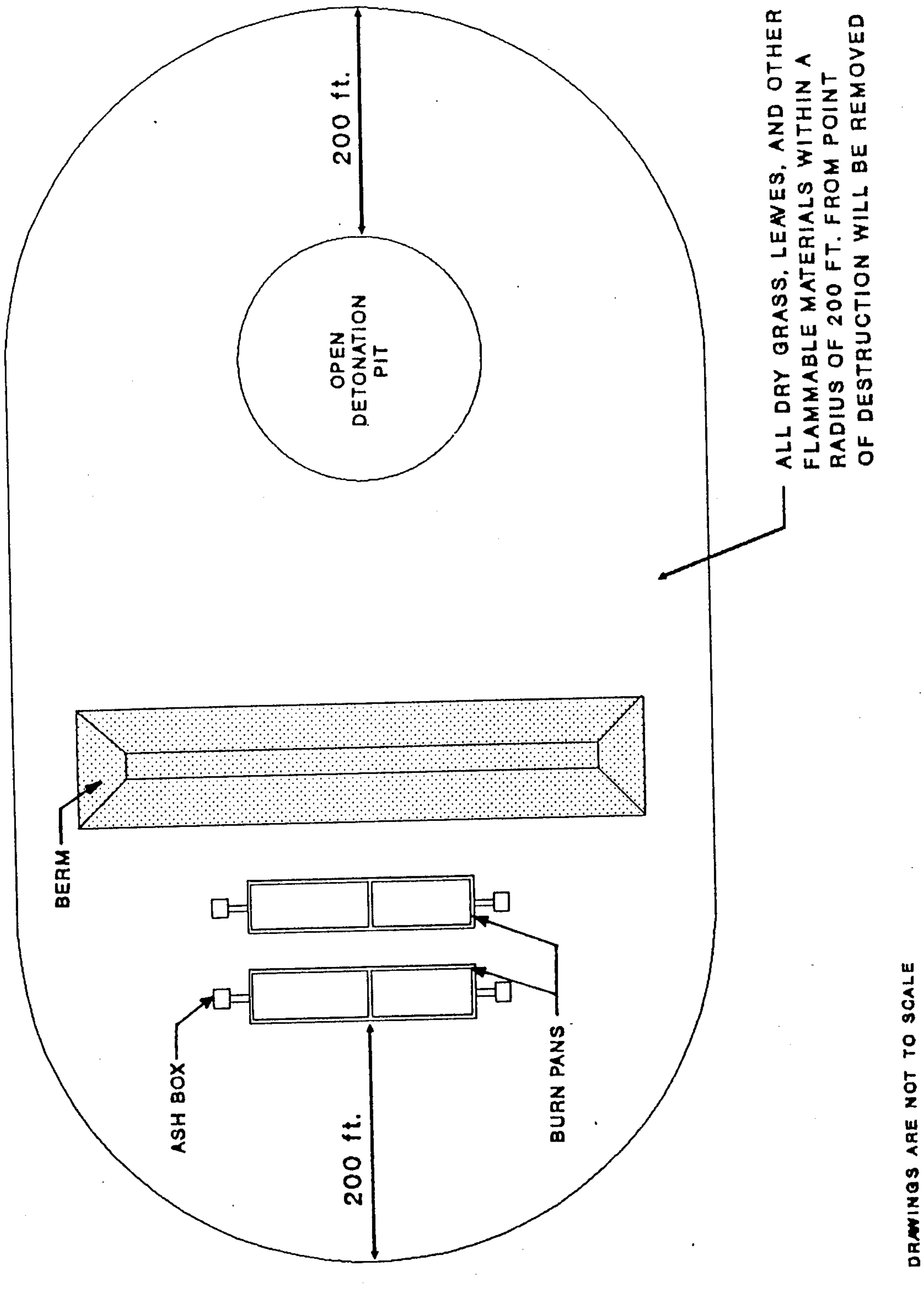

Figure 1-25 Design Concept for an EOD Facility

burning area and the open detonation area. This berm will protect the burn pans from high velocity "line of sight" fragments coming from the open detonation pit during disposal by detonation.

In the immediate area of the EOD facility, all dry grass, leaves, and other flammable material within a radius of 200 feet from the points of detonation will be removed. An exclusion area, or fragment zone, 794m (2,605 feet) in radius from the center of the open detonation area will be established. This area will be fenced to prevent an individual from straying into the fragment zone during an ordnance disposal. A safety buffer zone 200m further out from the exclusion zone will be established and marked with signs equally spaced around the periphery.

A protective bunker will also be constructed which provides line of sight to the facility approximately 800 meters from the disposal site. This bunker will be used by EOD personnel during dud destruction and propellant residue burning. The construction for the bunker will be similar to the artillery observation posts located on the periphery of the impact area.

1.3.5 Tactical Aviation Training Areas

The purpose of tactical aviation training is to provide for aviation units experience with aviation support, navigation aids, air warnings, air transportation and reconnaissance activities. Tactical aviation training is most effective when coordinated with battalion and company task force exercises. Tactical training areas serve the following functions:

- Provide areas for aircraft to group by tactical units.

- Provide locations to practice ground based activities such as minor maintenance, refueling and establishment of communications with ground forces.

- Provide areas for tactical units to occupy for several days at a time to practice setting up and shifting field operations. The two units which train at Camp Shelby need both a primary and an alternate site to permit them to practice shifting their operations.

Tactical aviation sites will be used during Annual Training periods, with a minimum of 50 days and a maximum of 60 days. These sites will be used for a maximum of four weekends in addition to the summer training period. Aviation areas will be used for all types of large and small helicopters, including the UH-1, OH-58, CH-47, AH-1, UH-60 and AH-64. The number of aircraft will vary depending on the size of unit which is training but could be as high as 45 aircraft for a battalion size unit.

Aviation units will tactically occupy the sites. This will include bivouac sites surrounding the aviation area where personnel will conduct 24 hour operations. Four Tactical Aviation Training Areas are proposed to be constructed within Camp Shelby. A total of 10 possible locations has been identified. Site preparation would entail clearing vegetation and grading

and sloping land for helicopter parking. Exposed soils would be aggressively revegetated, for dust suppression as well as erosion control. Each site will also require the construction of earth berms to surround parked fuel tanks and trailers.

Of the four proposed sites, three would require a minimum cleared area of about 300 meters by 300 meters, or 22 acres, and a maximum area of 500 meters by 500 meters, or 62 acres. At one site, clearing and grading would be required for an area of up to 800 meters by 800 meters, or 158 acres, for a battalion size occupation area. In addition to the clear area defined for aircraft operations at each site, there would be an approximately 50 to 100 meter (165 to 330 foot) deep area in which there would be some thinning of trees so that vehicles may be parked and tents erected for unit bivouac purposes. The exact area cleared or thinned would depend upon the configuration of the area available. Wetlands and other sensitive elements would be avoided.

All sites proposed for use in this document were selected so as to require minimum or no clearing of forest vegetation. All have been cleared or harvested within the past three years, and do not include mature trees on the majority of the area. The exact proposed boundaries of each site have been drawn according to the environmental restrictions discussed in Section 1.1.6. Following this, the actual size of the usable central site for aircraft operations at each location varied greatly, from less than 20 to about 80 acres (see Figures 3-28 and 3-29).

Sites were selected so that they were not all within the Camp Shelby Restricted Airspace (R4401). Aircraft within R4401 are controlled by Range Control, where each movement must be pre-coordinated and approved, therefore individual training is more difficult to accomplish. Ideally, the distance between sites should be great enough to allow realistic unit movements, approximately 11 to 12 km (6 to 7 miles). Also, sites are not proposed to be located within maneuver corridors or other areas proposed for tracked vehicle maneuver, as the two uses are considered incompatible, and potentially dangerous if night maneuvers take place.

Ten alternative sites have been identified as potential Tactical Aviation Areas. The potential sites are (see Figure 1-26):

- Site 1: Grid CK09744130, 19 acres
  The site is an open area previously used by aviation units. The site will accommodate some number of aircraft less than a battalion size. The area is flat and clear. The woods around the tactical aviation area (TAA) need to be cleared 100 meters deep. The area across the road also needs to be cleared into the woodline. This site is located within R-4401.

- Site 2: Grid CK 07574799, 64 acres
  The site is open and has been cleared. The area will allow a battalion or larger element access. In order to use this location, further clearing and some slope preparation will be required. Some clearing will need to be done 100 meters into the woodline. The site is easily accessible by road. This site located within R-4401.

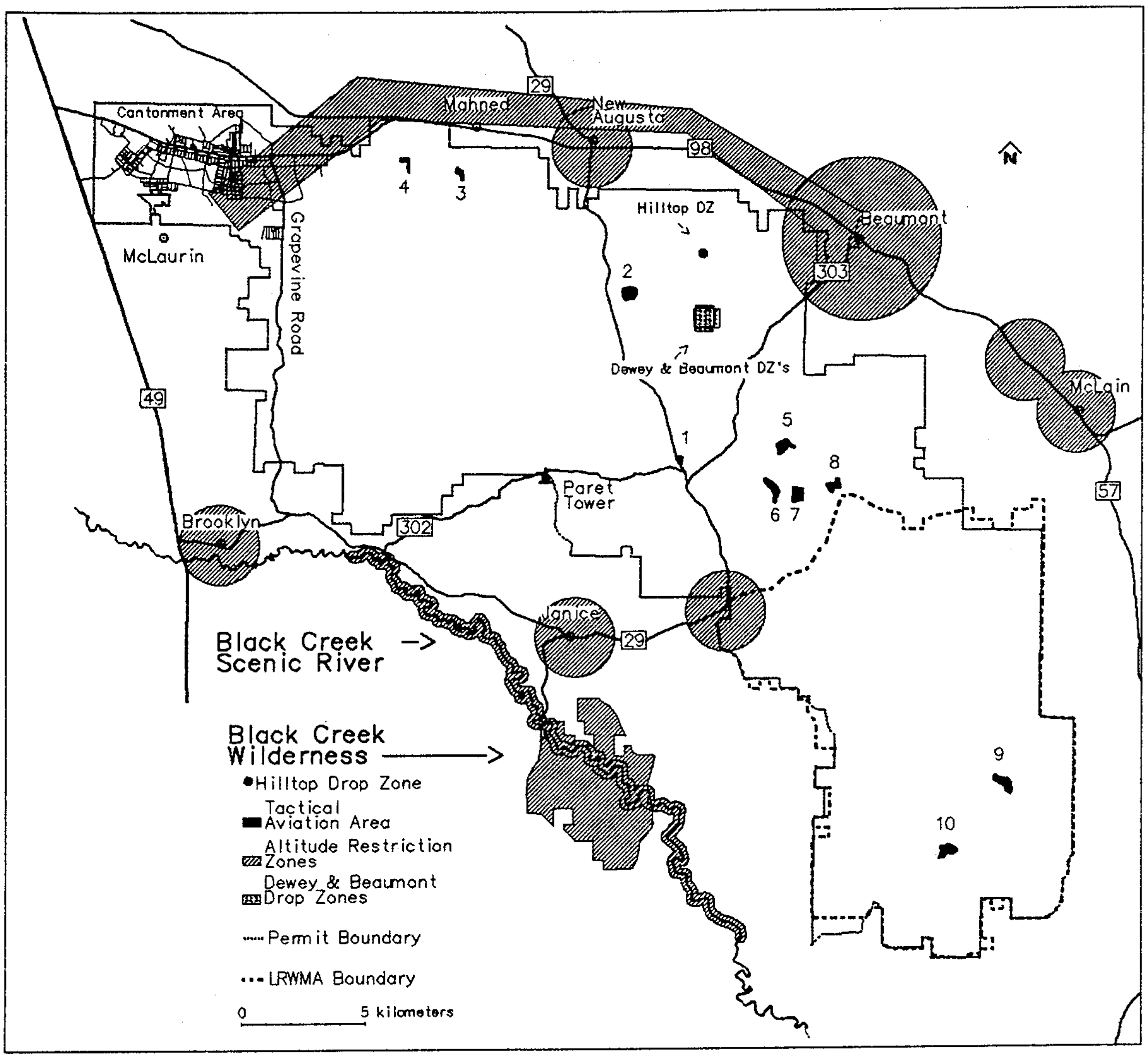

Figure 1-26 Air National Guard Drop Zones and Proposed Tactical Aviation Areas

- Site 3: Grid CK 00855253, 22 acres
  The site is an open area previously used by aviation units. The site will accommodate some number of aircraft less than a battalion size. The area is flat and clear. The area around the site could be better used if cleared 100 meters deep. The site is easily accessible by road. This site located within R-4401.

- Site 4: Grid CK 98615301, 25 acres
  The site is an open area previously used by aviation units. The site will accommodate some number of aircraft less than a battalion size. The area is flat and clear. The site is easily accessible by road. This site located within R-4401.

- Site 5: Grid CK 13864189, 58 acres
  The site is open and has been cleared. The area is large enough to accommodate a battalion or larger size unit. In order to use this area for aviation, some further clearing and slope preparation will be required. Some additional clearing 100 meters into the woodline is required. The site is easily accessible by road.

- Site 6: Grid CK 13394015, 60 acres
  The site is open and has been cleared. The area is large enough to accommodate a battalion or larger size unit. In order to use this area for aviation, some further clearing and slope preparation will be required. Some additional clearing 100 meters into the woodline is required. The site is easily accessible by road.

- Site 7: Grid CK 14443918, 50 acres
  The site is open and has been cleared. The area is large enough to accommodate a battalion or larger size unit. In order to use this area for aviation, some further clearing and slope preparation will be required. Some additional clearing 100 meters into the woodline is required. The site is easily accessible by road.

- Site 8: Grid CK 15994028, 44 acres
  This site has previously been on the list of sites reviewed (identified as Site 7). Use in conjunction with maneuver areas for combined arms operations should be considered.

  The site is open and has been cleared. The area is large enough to accommodate a battalion of larger size unit. In order to use this area for aviation, some further clearing and slope preparation will be required. Some additional clearing 100 meters into the woodline is required. The site is easily accessible by road.

- Site 9: Grid CK 22782840, 91 acres
  The site is open and has been cleared. The area is large enough to accommodate a battalion or larger size unit. In order to use this area for aviation, some further clearing and slope preparation will be required. Some additional clearing 100 meters into the woodline is required. The site is easily accessible by road.

- Site 10: Grid CK 20692559, 62 acres
  The site is open and has been cleared. The area is large enough to accommodate a battalion or larger size unit. In order to use this area for aviation, some further clearing and slope preparation will be required. Some additional clearing 100 meters into the woodline is required. The site is easily accessible by road.

1.3.6 Combined Arms Live-Fire Exercise Assembly Areas (CALFEX-AAs)

An Environmental Assessment (EA) was prepared by the U.S. Forest Service (USFS) in April, 1988 which discussed the CALFEX Range. (Draft EA for CALFEX Assembly Area Camp Shelby). The purpose of the CALFEX Range is command and control of combined arms live firing units. For efficient operation of the CALFEX range, crews and units waiting in sequence to enter the course require a systematic staging or assembly location. These assembly areas must be able to hold several small units, consisting of several vehicles each, in an efficient manner, able to begin movement to the CALFEX live-fire range when scheduled. Each assembly area must be large enough to permit about 20 tracked vehicles to congregate at one time. The need for three tracked vehicle assembly areas and a battalion task force tactical operations center (TOC) in support of the ranges was not discussed in the USFS EA, and is examined here as a "facility."

Four potential assembly areas have been identified, three of which will be developed (See Figure 1-18). This requires approximately 25 acres for each site. At each area, existing trails will be upgraded to approximately 16 feet wide and 1/2 mile long. These areas will be graveled, with necessary culverts, lead-off ditches and fill material will be used to ensure there is adequate support for tracked vehicle traffic. Roadguards will be used along existing road entry locations for safety purposes. Some removal of timber will be necessary.

A separate TOC area will be constructed which will be used by three to five tracked command vehicles. The vehicles will be parked and utilized for communications, command and control. This area will be nine to ten acres in size. The TOC will be located at a high spot where it can serve the CALFEX Assembly Areas.

Concurrent training, a lesson or activity which takes place while a soldier or crew is waiting for a place at a live-fire position, will also occur in the assembly areas. This activity is designed to help prepare for the actual firing task, but does not, itself, require the actual firing range. "Dry-firing" of a rifle and practice in finding and holding sight pictures are examples of concurrent training associated with rifle marksmanship. In the CALFEX context, concurrent training means practice in "target acquisition" and simulated firing, including use of the Multiple Integrated Laser Engagement System or MILES (eyesafe) laser scoring system. In such training, one or more vehicles maneuver in and out of cover, and other gun crews practice sighting and "firing" in a manner which helps to prepare them for the live-fire CALFEX exercise.

When used for concurrent training of the type described above, single vehicles or small numbers of vehicles (three to five) will be placed in varied sites within a portion of the area or along Grapevine Road, and a target vehicle will drive across their line of sight or pull in and out of view. Target vehicles will be wheeled vehicles in non-track maneuver areas. The sighting crews will practice "seeing" the target, sighting on it with the MILES (eyesafe laser) equipment, and will be scored on the time to find the target and the number of times they hit the target with the laser beam.

1.4 Studies Required Before Implementation

The mitigation measures and Special Use Permit stipulations developed and disclosed in this Environmental Impact Statement will be carefully applied to ensure the most environmentally acceptable boundaries are delineated for the proposed training areas and corridors during implementation. Engineering plans discussed in Section 1.4.1 will be developed and utilized to ensure the appropriate mitigation measures are implemented during construction and operation of these areas.

1.4.1 Site Engineering Evaluation

The designation of those areas to be cleared, thinned, and available for tracked vehicle use are presented in Section 1.2.1.3.1 and Table 1-4. They depict the general area proposed for track training purposes; the exact boundary will reflect implementation of the appropriate mitigation measures identified in the Final Environmental Impact Statement. Engineering and planning of those areas to be cleared, thinned, protected, and/or unmodified will follow selection of alternative 1, 2, 3A or 3B. It is at this time that the planning, design and environmental protection principles outlined above, and presented in greater detail in Chapter 3 of this document, will be implemented. Wetlands (and their buffers) will be delineated and marked, as will habitats of threatened and endangered species, lands with slopes greater than 10 percent, and other areas agreed in this document to be environmentally sensitive and not proposed to be used for tracked vehicle training. The final proposed plans for clearing and thinning will be prepared only after such sensitive areas are known and delineated. This will be performed jointly by Camp Shelby engineering personnel, Forest Service personnel, and representatives of the U.S. Fish and Wildlife Service, as appropriate.

1.4.2 Compliance with Biological Opinion

The 1992 and 1993 Biological Opinions on the Gopher Tortoise prepared by the U.S. Fish and Wildlife Service and issued to the National Guard Bureau/Mississippi Military Department and the U.S. Forest Service sets several requirements with which all training area development must comply (see Appendix L). Among these are identification of tortoise colonies, priority soils (i.e., soil types determined by the gopher tortoise recovery plan to be of highest priority for availability for possible tortoise colonization), provision for habitat corridors, relocation of certain individual tortoises not associated with a colony, and other measures deemed necessary to assure viable tortoise populations. Through the preparation

and publication of this EIS and its Record of Decision (ROD), the Army National Guard and the Mississippi Military Department are committed to full compliance with this Biological Opinion. The exact boundaries of these colonies, required buffers, priority soils, and certain other information which will be required for site development will be dictated by implementation of appropriate mitigation measures identified in this EIS. Further, some changes in the location of colonies and individual burrows will take place continually over time. It is recognized that even the best current data will become somewhat out of date prior to implementation of any action alternative. All training areas, travel corridors, and facility boundaries proposed were developed specifically to avoid gopher tortoise colonies, burrows, and priority soils where possible. Simultaneous with the site engineering studies described in Section 1.4.1, all required updates to the identification and delineation of tortoise colony boundaries and burrow locations will be prepared so that final development plans contain the best and most current data.

Biological evaluations, and biological assessments if required, will also be prepared for all development plans which have the potential to affect threatened, endangered, and sensitive plant and animal species other than the Gopher Tortoise. These evaluations will also become a part of the development plan for the training areas and corridors.

1.5 Environmental Documentation Required

The proposed Piñon Canyon land exchange between the Department of the Army and the U.S. Forest Service is no longer an issue, and will not be further discussed. The Piñon Canyon lands were transferred directly to the U.S. Forest Service (USFS). The Training Facilities EIS prepared by Weatherford McDade and the resultant ROD will be referenced as appropriate within this EIS. The facilities planned for the Cantonment Area, again covered in the Training Facilities EIS, will not be covered in this EIS.

The U.S. Forest Service Record of Decision on the Facilities located in the Operations Area and which were addressed in the Facilities Final EIS will be issued concurrently with the Record of Decision for this Environmental Impact Statement. That ROD will be the Forest Service decision document for the East Range Road, M-16 Night Firing Range, and the Automated Record Fire Ranges. The machine gun transition range identified in the Facilities Final EIS may require additional site specific National Environment Protection Agency (NEPA) analysis before a Forest Service decision can be made. The USFS ROD will also address the following facilities in the Operations Area: Multi-Purpose Range Complex - Heavy, Tactical Aviation Areas, and the Combined Arms Live Firing Exercise (CALFEX) Assembly Areas.

Because of the conceptual nature of current site planning for the following proposed facilities described in Section 1.3 above, they will be treated in a general, programmatic manner in this EIS: Explosive Ordnance Facility and Automatic Tank Wash Facility. Prior to actual implementation, Camp Shelby will do more specific environmental analysis by: 1) by completing a biological evaluation of the project effects on proposed, threatened, endangered,

and sensitive species; 2) completing Integrated Training Area Management (ITAM) studies in each area, including monitoring of sediment in the wetlands; 3) meeting archeological requirements; and 4) characterizing for each land management unit indigenous species diversity as representative of habitat and geographic area, moderately representative; or poorly representative. If not well representative, indicate cause of low diversity (e.g., pollution, eroded soils, exotic species, or at the margin of its natural range). Preparation of project specific site plans and engineering implementation plans for each project will be integrated with detailed environmental analysis.

This EIS will serve as the decision document for the construction of Tank Table VIII (Upgrade of Range 45). The Tank Table VIII project is examined in greater detail than the other, more conceptual, projects included in this EIS, and more complete discussion of the proposed action, affected environment, and environmental protective measures proposed is contained for this project in Chapter 3.

The examination of land contamination issues incorporated in this study will also comply with the requirements for the provisions of 40 CFR(51) of the Clean Air Act Ammendments of 1990 and Preliminary Assessment Screening (PAS) studies required prior to real estate actions by Section 12-5, AR 200-1, *Environmental Protection and Enhancement.* They will also provide information to be used in completion of the procedures outlined for such studies in AR 200-1, AR 405-10, *Acquisition of Real Property & Interests Therein*; AR 405-80, *Granting the Use of Real Estate*; and AR 405-90, *Disposal of Real Estate*.

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Final
Environmental Impact Statement

Military Training Use of National Forest Lands: Camp Shelby, Mississippi

Chapter 2

AFFECTED ENVIRONMENT

2.0 AFFECTED ENVIRONMENT

This portion of the EIS is intended to present the setting of Camp Shelby, acknowledging its presence without detailed analysis of environmental impact. Present, ongoing military land uses are included in some detail, because such uses are proposed to continue under most alternatives. The environmental consequences, which have resulted from the present activities of Camp Shelby, are presented in Section 3.1. The examination of the consequences of the newly-proposed alternatives is performed in Section 3.3.

2.1 Installation Location

Camp Shelby, the largest National Guard training installation in the United States, is located in Southeast Mississippi. It occupies approximately 134,000 acres of land in Southeast Mississippi and covers portions of Forrest, George, and Perry Counties (See Figures 1-2 and 1-3). The majority of the installation lies in Perry County.

2.1.1 Military Land Use

Training activities at Camp Shelby occur in either the Cantonment Area or the training/maneuver area, commonly referred to as the Operational Area. The training facilities located in the Cantonment Area involve non-firing, non-maneuver activities, including classrooms.

The Operational Area extends south and east from the Cantonment Area, covering the area within the Special Use Permit (SUP) granted by the U.S. Forest Service (USFS). Firing ranges, the impact area, proficiency courses, maneuver areas, tracked vehicle maneuver areas and bivouac sites are contained within this area. The Operational Area is approximately 127,000 acres. Within the installation boundary are 114 artillery firing points and 17 mortar firing points. There are 64 individual training areas within the Camp Shelby Operational Area, many of which are used at different times for several different military training purposes.

2.1.1.1 Special Training Facilities

Cantonment Area Training Facilities: Within the Cantonment Area are non-firing training areas and facilities. The close-in training area (CITA) is located here as well as the Mississippi Military Academy.

Ammunition Supply Point: Camp Shelby utilizes an ammunition supply point (ASP) located southeast of the Cantonment Area that is fenced and manned year round. Storage of all types of conventional ammunition and explosives used at Camp Shelby is provided at the ASP. A portion of the ASP is located on National Forest lands.

Drop Zones: The (troop) drop zone (DZ) is an open area approximately 460 acres in size, designated as Training Area 19. It is used for parachute training by airborne and other air drop qualification purposes. The Air Force National Guard (ARNG) maintains three drop zones which are used for cargo drop practice.

Helicopter Landing Areas: Located at Hagler Army Airfield and several outlying locations, helicopter landing areas are utilized by aviation units and infantry units in the transportation and deployment of troops from helicopters. Establishment of more closely defined, improved helicopter operating fields (termed Tactical Aviation Training Areas) is proposed in this EIS.

Bridge Training: The engineer units use Lake Janney for training in erecting and launching of portable bridges.

2.1.1.2 Maneuver and Tactical Training

The descriptions, a through t, in Table 2-1 characterize the training usage of each of the 64 designated training areas of Camp Shelby (see Figure 2-1). Table 2-2 utilizes these codes to describe the typical uses which are made of each training area. This table also notes for how many days during 1986 and 1987 that area was assigned exclusively to a unit for training. These data, which represent the only recent years for which full information is available, do not fully capture shared use and transient use.

For example, a unit may practice advances, communications and other training requirements while passing through, or along a training area on the roadway. No record will exist that the unit has "used" that training area. There are many instances in which use may be shared among several smaller units at the same time, especially for low impact exercises such as map reading and patrolling. Training Areas 42 through 63 are also used for overflight, navigation, and nap-of-the-earth (NOE) flight training by aviation units without a record being created that a unit has been assigned there. Certain types of special operations, convoy training and air assault training may take place on roads and corridors passing through or between numbered areas. Thus these data represent the minimum probable usage of the training areas involved.

Each of these types of usage (Table 2-1 below) is derived from the ongoing training activities examined in Section 1.2.1.1.4. They are described in more detail in Appendix C. Table 2-2 shows the manner in which these uses were accommodated at Camp Shelby in two typical years.

Table 2-1 Training Area Usage Codes

Usage Code	Typical Uses	Usage Code	Typical Uses
a.	Bivouac and Small Unit Tactics	k.	Engineer ARTEP Training
b.	Convoy Training	l.	Mortar Training
c.	Medical Training	m.	Engineer Brigade Training
d.	Aviation Training	n.	Land Navigation Training
e.	Airborne Training	o.	Primary Leadership Training
f.	Supply and Service Training	p.	Water Purification Training
g.	NBC Training	q.	Air Force Tactical Training
h.	Patrolling	r.	Tracked Vehicle Maneuver and ARTEP Training
i.	Artillery Training	s.	Special Operations
j.	Infantry ARTEP Training	t.	Vehicle Swim Operations

Table 2-2 Typical Training Area Assignments (Pages 3-5)

Training Area	Typical Uses	No. of Days assigned	
		1986	1987
1	a, b, f, g, h, j, k, n, s	84	74
2	a, b, f, g, h, j, k, n, s	80	82
3	a, b, f, g, h, j, k, s	79	49
4	a, b, f, g, h, j, k, s	82	121
5	a, b, f, g, h, j, k, n, o, s	85	36
6	a, b, f, g, h, i, j, k, s	111	149
7	a, b, f, g, h, i, j, k, p, s	83	38
8	a, b, c, d, g, h, i, j, k, p, s	54	80
9	a, b, c, d, g, h, i, j, k, s	56	90
10n	a, b, c, d, g, h, i, j, k, s	179	216
10s	a, b, g, h, i, j, k, s		
11	a, b, g, h, i, j, k, s	175	215
12	a, b, g, h, j, k, s	22	30

Table 2-2 Typical Training Area Assignments (Pages 3-5)

Training Area	Typical Uses	No. of Days assigned	
		1986	1987
13	a, b, d, g, h, j, k, s	22	30
14	a, b, g, h, j, k, s	65	34
15	a, b, g, h, i, j, k, s	183	224
16	a, v, d, g, h, i, j, k, r, s	186	214
17	a, b, g, h, j, k, r, s	186	212
18	a, b, g, h, i, j, k, s	180	205
19	a, b, c, d, e, g, h, i, j, k, r, s	96	167
20	a, b, g, h, j, k, s	175	190
21	a, b, d, g, h, i, j, k, r, s	185	228
22	a, b, g, h, j, k, s	174	190
23	a, b, g, h, j, k, s	185	220
24	a, b, d, g, h, i, j, k, s	174	191
25	a, b, d, g, h, i, j, k, r, s	185	230
26	a, b, g, h, i, j, k, s	87	187
27	a, b, g, h, j, k, s	48	45
28	a, b, d, e, g, h, i, j, k, r, s	68	87
29	a, b, c, g, h, j, k, s	107	87
30	a, b, c, d, g, h, i, j, k, s	174	190
31	a, b, g, h, j, k, s	174	175
32	a, b, d, g, h, i, j, k, s	87	178
33	a, b, d, g, h, i, j, k, r, s	105	192
34	a, b, g, h, j, k, s	88	45
35	a, b, g, h, i, j, k, s	100	83
36	a, b, d, g, h, i, j, k, k, q, s	175	210
37	a, b, g, h, i, j, k, s	95	177
38	a, b, d, g, h, i, j, k, r, s	106	193
39	a, b, g, h, j, k, s	77	155
40	a, b, g, h, i, j, k, r, s	96	193

Table 2-2 Typical Training Area Assignments (Pages 3-5)			
Training Area	Typical Uses	No. of Days assigned	
		1986	1987
41	a, b, d, g, h, i, j, k, q, s	15	169
42	a, b, g, h, j, k, s	15	0
43	a, b, d, g, h, i, j, k, k, m, p, r, s, t	202	117
44*	h, i, n	102	117
45	a, b, g, h, j, k, s	78	157
46	a, b, f, g, h, j, k, s	92	155
47	a, b, g, h, j, k, r, s	58	47
48	a, b, d, g, h, j, k, s	1	0
49	a, b, d, g, h, j, k, r, s	27	47
50	a, b, c, d, f, g, h, j, k, s	2	15
51	a, b, d, f, g, h, j, k, s	13	30
52	a, b, d, f, g, h, j, k, s	30	30
53	a, b, d, g, h, j, k, s	13	30
54	a, b, d, g, h, j, k, r, s	28	62
55	a, b, d, g, h, j, k, s	22	15
56	a, b, d, g, h, j, k, s	18	32
57	a, b, d, g, h, j, k, s	26	32
58	a, b, d, g, h, j, k, s	16	30
59	a, b, d, g, h, j, k, s	16	0
60	a, b, d, g, h, j, k, s	5	15
61	a, b, d, g, h, j, k, s	5	0
62	a, b, d, g, h, j, k, s	10	30
63	a, b, d, g, h, j, k, s	5	4
64	a, b, d, g, h, j, k, s	15	0

* T44 is now designated as a Gopher Tortoise refuge, and is not assigned for tank maneuver training use.

2.1.1.3 Range and Weapons Firing Uses

2.1.1.3.1 Army National Guard and Land Based Weapons

Camp Shelby has range facilities for familiarization firing and qualification firing of weapons systems ranging in size from the 9mm pistol and 5.56mm rifle to the 8-inch howitzer. Firing ranges are available for individual and crew operated weapons, artillery and mortar firing, anti-tank weapons and use of demolition charges.

There are 114 field artillery firing points available for full batteries of any caliber from 105mm to 203mm (8-inch). There are 17 mortar firing points within the present boundary of the installation accommodating mortars from 60mm to 107mm. Firing points are located within maneuver areas and their use must be well coordinated to avoid conflicts with other training activities. Certain ranges on Camp Shelby are "non-firing," meaning that troops use simulated weapons and training devices such as the Multiple Integrated Laser Engagement System (MILES) eye-safe laser scoring system to practice sighting and other tasks without expending ammunition. Eye-safe lasers are utilized with certain weapon systems throughout the ranges and training areas. Non eye-safe lasers are used only on the live-fire ranges.

Table 2-3 describes the various live fire and simulated ranges utilized at Camp Shelby on a permanent year round basis. Locations of ranges are designated on Figure 2-1. These firing ranges are considered vital to the mission of the National Guard.

2.1.1.3.2 Aircraft Weapons Ranges

Two ranges are used exclusively by Air Force (primarily Air National Guard) aircraft. These ranges are range 202E and 201W. Range 201W and its safety fan are located inside the current Impact Area and is the only Air-to-Ground range where live (i.e., explosive) ammunition with weapons including 20mm and 30mm cannon, 2.75in rockets, high explosive bombs and practice bombs may be utilized. On Range 202E, weapons including 20mm and 30mm cannon, 2.75in rockets and practice bombs utilizing only non-explosive practice ammunition are allowed. Use of this range requires closure of about 4,000 acres for safety. Air Force and Air National Guard units from several states currently utilize these ranges. Usage of these ranges during Training Year 1992 was by 22 Air Guard units from 17 states, and involved 2,206 separate flights spread throughout the year. This usage is discussed in greater detail in Appendix C, Part 6.

2.1.2 Military Use Areas Closed to General Use

Certain military uses, primarily those which utilize weapons firing, require that all persons, military and civilian, be required to remain outside the area used for this purpose. At Camp Shelby, there are two such restricted areas.

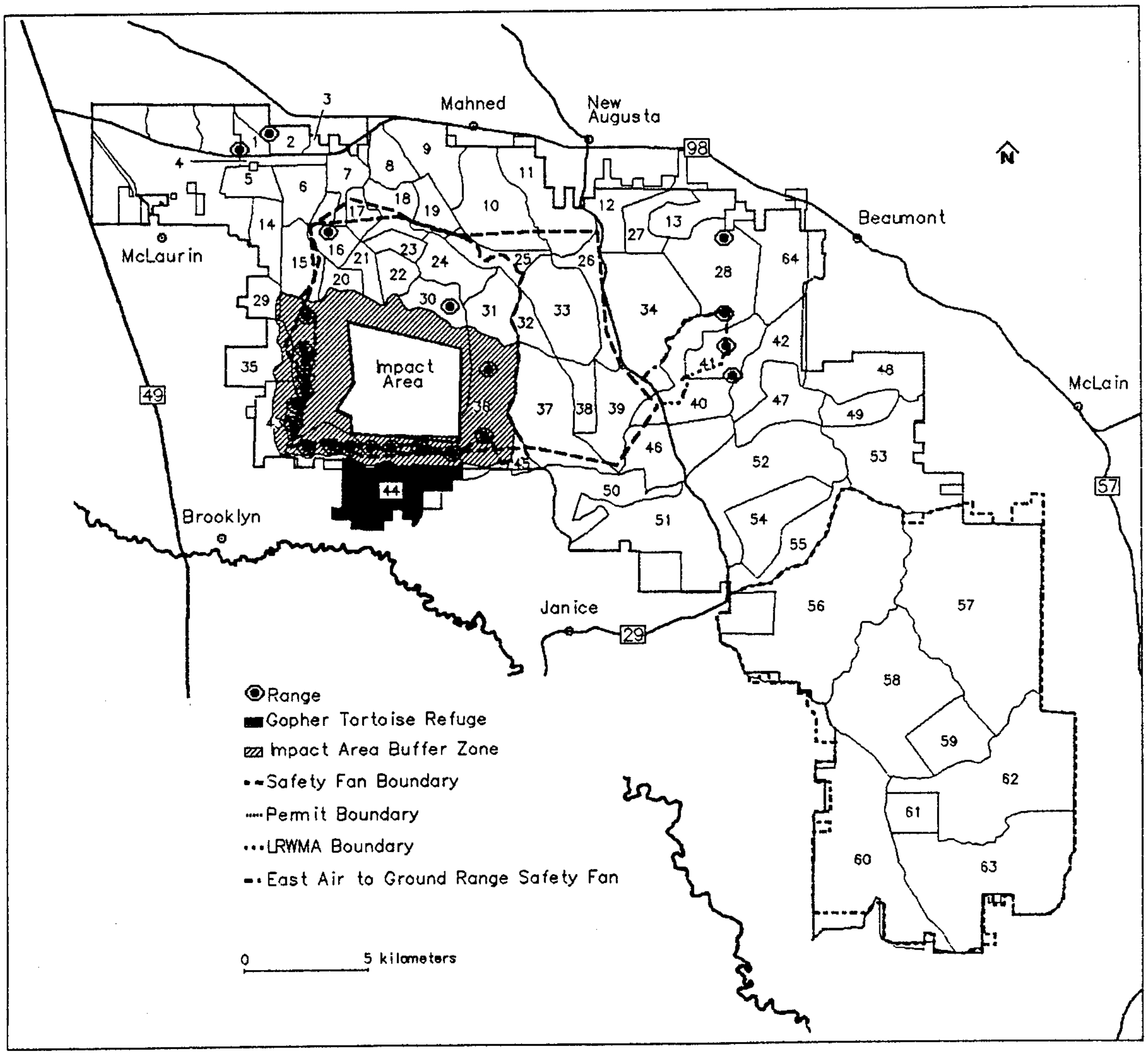

Figure 2-1 Ranges and Numbered Training Areas Now in Use at Camp Shelby

Table 2-3 Range Descriptions (Pages 7-9)	
4-A	Used for demolition training with charges no larger than 1/4 pound.
5	Used for TOW/HE Firing.
6-A	Used for demolition training with charges up to 320 pounds with the large tank fan closed.
8-A	Laser range finder for use of AN-TV Q2 GVLLD.
10-A	Used as a scaled TOW (tube launched, optically tracked, wire-guided anti-tank missile) and Dragon (similar to TOW except man-portable) tracking range for use with the training set only. This is a non-firing range.
12-A	90mm recoilless rifle firing on one firing lane.
12-B	Used for M-18 Claymore, 5.56mm rifle and 7.62mm machine gun familiarization.
12-C	Direct fire 60mm mortar ILL/HE.13-A Firing of the TOW.
13-B	Firing of the Dragon.
14-A	Artillery direct fire with the 155mm and 203mm (8inch) howitzers.
14-B	Familiarization with the .50 caliber and 7.62mm machine guns.
18-A	Mechanized Infantry Platoon Battle Run 50 caliber, 7.62mm, 5.56mm, 40mm pract., and 35mm subcaliber.
18-B	Tank Platoon Battle Run. Weapons fired are the 105mm and 120mm main gun, .50 caliber and 7.62mm machine guns and 5.56mm rifle.
18-M	Table V firing of the M2/M3 Bradley Fighting Vehicle. Weapons fired are the 7.62mm machine gun and the 5.56mm rifle.
19-A	Combat Engineer Vehicle for firing the 7.62mm coaxial machine gun.
19-B	Combat Engineer Vehicle for firing the 165mm main gun and the .50 caliber machine gun.
40-B	Used for tank crew combat firing tank tables VII and VIII. Weapons used are the 105mm and 120mm main gun, .50 caliber machine gun and 7.62mm coaxial machine gun. No high explosive ammunition is used on this range.
40-E/G	Used for tank crew combat firing tank Tables VII and VIII. Weapons used are the 105mm main gun, .50 caliber machine gun and 7.62mm coaxial machine gun, M1-LFR and M60-A3 (AN/VVG-2) Laser Range Finder. No high explosive ammunition is used on this range.
40-C	Mechanized Infantry squad carrier course for firing the .50 caliber and 7.62mm machine guns.
40-M	Used for firing (Table V) of the M2/M3 Bradley Fighting Vehicle.
40-O	Used for gunnery training (Table VI) and zeroing in on the M2/M3 Bradley Fighting Vehicle.

Table 2-3 Range Descriptions (Pages 7-9)	
40-P	Used for the M2/M3 Tables VII and VIII, including stabilized battle run and stationary positions.
41-A	Used for tank crew combat firing Table VI, using 105mm 120mm main gun and 7.62mm machine gun.
41-B	Used for tank crew combat firing Tables VII and VIII, using 105mm main gun and .50 caliber, and 7.62mm machine guns.
41-C	Used for firing .50 caliber and 7.62mm machine guns, ground mounted only.
41-E/G	Used for tank crew combat firing Tables VII and VIII, using 105mm and 120mm main gun and .50 caliber and 7.62mm machine guns, and Laser Range Finders.
41-M	Tank Table V firing of the M2/M3 Bradley Fighting Vehicle, using 7.62mm coaxial machine gun.
41-O	Gunnery and zeroing of the 25mm gun and 7.62mm coaxial machine gun of the M2/M3 Bradley Fighting Vehicle.
41-P	Used for Tables VII and VIII for the M2/M3 Bradley Fighting Vehicle, using 25mm gun, 7.62mm machine gun, and 5.56mm rifles.
42-A	Combat pistol qualification with .22, .38, 9mm, and .45 caliber pistols.
42-B	Training mechanized infantry squads in dismounted setting; weapons include 7.62mm machine gun, 5.56mm rifle, 40mm grenade launcher, Light Antitank Weapon (LAW) and mines.
43-A	Machine gun transition course for ground mounted .50 caliber and 7.63mm machine guns.
43-B	Stationary zero of 105mm tank main gun and .50 caliber and 7.62mm mounted machine guns.
44-A	Firing of .50 caliber and 7.62mm ground mounted machine guns.
45-A	Used for Tank Table VI, utilizing 105mm main gun and .50 caliber and 7.62mm mounted machine guns.
45-B	Used for Tank Tables VII and VIII, with 105mm main gun and .50 caliber and 7.62mm mounted machine guns.
45-C	Used for .50 caliber and 7.62mm mounted machine gun familiarization.
45-O	Used for Table VI and zeroing for 25mm main gun and 7.62mm coaxial machine gun for M2/M3 Bradley Fighting Vehicle.
46-A	Firing of 66mm LAW and 40mm grenade launcher.
46-C	Firing of 14.5mm (subcal) artillery training round, simulating firing of field artillery.
47-A	Field Fire (qualification) range for the 5.56mm rifle.

Table 2-3 Range Descriptions (Pages 7-9)	
47-B	Used for 90mm subcaliber and Tank Tables I, II and III, including moving target capability.
47-C	Small arms range for firing .50 caliber and 7.62mm machine guns and 5.56mm rifle at distances of 10 and 25 meters.
48-A	Record fire qualification for the 5.56mm rifle.
48-B	Familiarization and record firing with the .22 caliber, .38 caliber, 9mm and .45 caliber pistols.
50-B	Record fire with the 5.56mm and 7.62mm rifles and 12 gauge combat shotgun at a distance of 25 meters.
50-C	Used for qualification with the 5.56mm rifle, and familiarization with the 7.62mm rifle and 12 gauge shotgun at a distance of 25 meters.
50-D	Used for qualification with the 5.56mm rifle and 12 gauge shotgun at a distance of 25 meters.
186-A	Helicopter door gunner course for 7.62mm machine gun.

2.1.2.1 Dedicated Impact Area

The impact area for artillery rounds is approximately 4,000 meters square (4,600 acres). General use of this area for other purposes is not allowed. A certain percentage of the artillery rounds have, over the many years of use, failed to explode on impact. Therefore, the areas where they are located are considered extremely unsafe. No other military or civilian use is allowed, and the National Guard enforces this closure. The impact area is in use throughout much of the year as all types of units train on weekends (IDT) in addition to Annual Training (AT). Its location allows ranges to be positioned around its perimeter.

Safety fans for each range cover the potential area a stray round or ricochet might travel from a range firing point. These safety fans extend into the impact area. The impact area is closed due to the potential hazard of unexploded rounds and the obvious danger from firing activity. An additional buffer zone of approximately 8,900 acres is located around the actual designated impact area (see Figure 2-1) to provide an extra margin of safety and control over access into the impact area. Both this buffer and the safety fans are for added safety only, and are not areas where explosive rounds are aimed or intended to strike.

2.1.2.2 Tank Safety Fan

The largest land area, outside the impact area and buffer, closed at any one time is the tank 105mm main gun safety fan, which encompasses about 16,000 acres. Muzzle velocity of the rounds fired and the width of the target array require an extensive safety fan when tanks are firing the main gun. It must be noted that the rounds do not strike in this zone; it is entirely for additional peripheral safety should the high-velocity round ricochet or fragment. Since the

tanks do not fire explosive rounds, no permanent hazard is created, thus the area is considered safe for entry when no tank main gun ranges are in use. The 120mm main gun and Bradley safety fans would be almost identical in extent, and cover about 8,000 acres.

Between 1986 and 1991, this safety fan was in place every week day for about 40 weeks per year as a part of the "M60A3" gunnery program. This program provided higher-quality sighting equipment for the older, M60 tank and required greater proficiency from the crew. This could not be completed in the normal, 2 week summer Annual Training (AT) period, and was carried out throughout the year. In addition, since 1984 Camp Shelby has used certain weekends for tank gunnery training for tank crews which could not complete their requirements during the AT period. In recent years, approximately 28 weekends have been devoted to such firing in addition to the 12 weekends associated with the AT period in summer. Some land use conflicts have resulted, as other potential users of the land area placed off limits have desired entry. The public concerns about these conflicts were identified in Section 1.1.7.

2.1.2.3 Other Restricted Areas

The U.S. Forest Service has designated some areas as "Restricted Use" for protection of sensitive vegetation areas, endangered plants, and wildlife species. The former Training Area 44, more than 2200 acres, was set aside by Camp Shelby as a refuge for the Gopher Tortoise in 1989. See Section 2.4.5.1.2, for more information on this threatened species. Other off limit areas include the proposed Ragland Hills Botanical Area north Lee Avenue and several parcels of land which are restricted because of private ownership or other reasons.

2.2 Political and Administrative Boundaries

Camp Shelby cuts across several county boundaries, as discussed above (Section 2.1). The maneuver and field training activities take place almost entirely within Perry County, and the lands covered by the Special Use Permit (SUP) lie, by definition, within the De Soto National Forest, Black Creek Ranger District. The incorporated area of the towns of New Augusta and Beaumont is immediately adjacent to the boundary of Camp Shelby at the North and Northeast edges of the installation, respectively. The town of McClain lies about 2.5 miles east of the installation, and the town of Wiggins lies about 12 miles south. The installation (special use permit) boundaries are congruent with National Forest boundaries only in the vicinity of New Augusta, to the North, and the south edge of Leaf River Wildlife Management Area, in the extreme southeast part of Camp Shelby.

2.3 Physical Environment

Units of Measure: Throughout Chapter 2, where descriptions are presented of training areas and the associated environmental factors, a majority of the units of measure for distance will be in the metric system, i.e., stated in meters rather than in feet or yards or miles. They are so stated because this is the original unit with which the feature has been measured or mapped. The Department of Defense (DoD) has used the metric system almost exclusively

for about 30 years, and all available training and planning maps contain metric coordinates only. The system utilized, for both printed paper maps and establishment of the geographic information system database, is termed Universal Transverse Mercator (UTM). Field studies were performed, data were stored, and calculations are made using meters. In every case where it is reasonable to do so, the approximate equivalent of each distance is given in feet, yards, or miles, as appropriate. A table of equivalencies between the customary (English) system and metric system is also found following the Glossary.

2.3.1 Climate

Climatic patterns at Camp Shelby are influenced primarily by weather systems in the Gulf of Mexico. Persistent humidity, moderate to heavy precipitation year long and mild temperatures are typical (Figure 2-2 and Appendix R). The gently rolling topography of the Southern Mississippi region does not significantly affect weather patterns (Weatherford McDade, 1991).

2.3.1.1 Precipitation

Average annual precipitation for the area is 59.9 inches (1520.2mm) based on 1951-1980 records (Table 2-4). Monthly averages range from 3.0 inches (75.2mm) in October to 6.4 inches (161.3mm) in March. Summer precipitation occurs primarily as afternoon thundershowers and prolonged droughts are rare. Thunderstorms occur approximately 60 times a year, about half of these occurring during the summer. Clear skies occur from 100 to 120 days per year (Weatherford McDade, 1991).

Snowfall is rare in the region; 82 percent of past years had no measurable snowfall and 86 percent of past years received less than three inches. Hail and freezing rain occur periodically but are usually localized and of short duration. Average relative humidity is 55 percent in mid-afternoon. Humidity is higher in summer than winter and highest at dawn (Weatherford McDade, 1991).

2.3.1.2 Temperature

The daily mean temperature in the Camp Shelby area is 65.8°F (18.8°C) and ranges from 81.4°F (27.4°C) in July to 48.4°F (9.1 °C) in January. Daily minimum temperatures range from 70°F in July to 37°F in January. Daily maxima range from 92°F in August to 60°F in January (Appendix R).

2.3.1.3 Winds

Prevailing winds are southerly and average monthly wind speed is greatest in March at 8 miles per hour. Wind speeds are generally highest in the afternoon and highest velocities occur during winter and spring (Weatherford McDade, 1991).

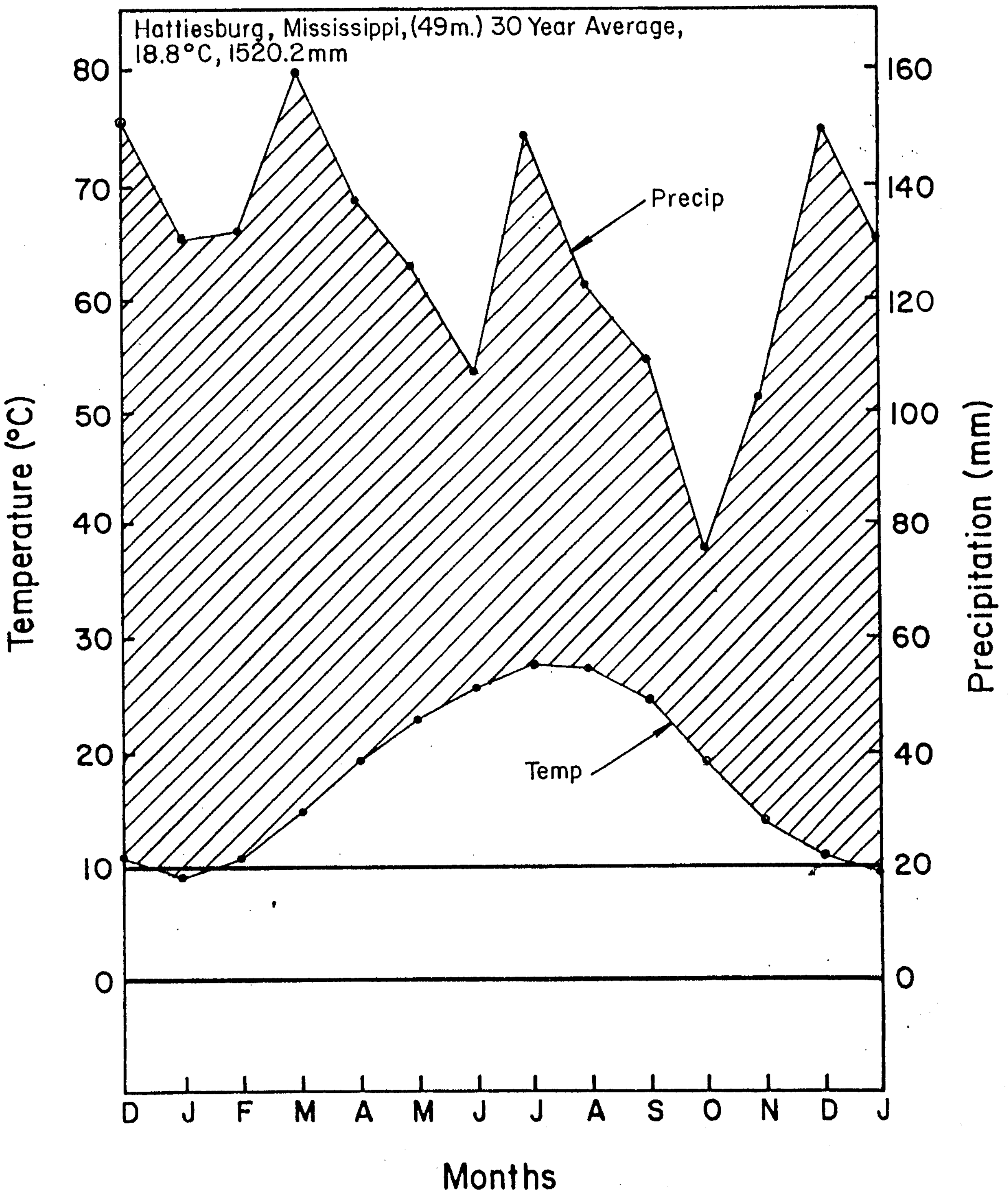

Figure 2-2 Climate Diagram For Camp Shelby Area

Table 2-4 Climatic (Temperature and Precipitation)

Patterns for Camp Shelby Area
Hattiesburg, Mississippi. Elevation 161 ft. or 49m.
Averages based on data from 1951-1980
Longitude W 89° 18' Latitude N 31° 19'

Month	Temperature °F	°C	Precipitation in.	mm.
January	48.4	9.1	5.1	130.3
February	51.6	10.9	5.5	138.9
March	58.8	14.7	6.4	161.3
April	66.6	19.2	5.4	137.9
May	73.0	22.8	5.3	135.1
June	79.3	26.3	4.2	106.7
July	81.4	27.4	5.9	150.9
August	80.9	27.2	4.8	122.2
September	76.8	24.9	4.3	108.5
October	65.8	18.8	3.0	75.2
November	56.6	13.7	4.0	102.4
December	50.7	10.4	5.9	150.9
Mean Annual Temp.	65.8	18.8		
Average Annual Ppt.			59.9	1520.2

Source: USAF Environmental Technical Applications Center (MAC), Scott Air Force Base, Illinois, 1990. The climatological data above was compiled by the National Oceanic and Atmospheric Administration, Hattiesburg, MS (1987), then compiled by Scott Air Force Base.

2.3.2 Noise

2.3.2.1 Military Weapons Noise

Noise levels at Camp Shelby vary depending on location, time of day and year, and type of noise produced. Commonplace audible noise (called "A-weighted" noise) includes vehicles, helicopters, and small arms fire. Lower frequency, cyclical waves (termed "C-weighted" noise) carry more energy and may cause windows or buildings to vibrate (Appendix I, Table I-2, page I-7). These may be caused by heavy weapons firing, exploding shells, and demolition activity, and are greatest near the impact area, tank firing ranges, and artillery firing points. The C-weight noise at Camp Shelby was plotted into three zones, with Zone III

having the highest noise level at greater than 70 decibels (Figure 2-3A). Zone II is between 62-70 decibels which is normally unacceptable for residential or noise sensitive areas, such as Wilderness Areas. Zone I is less than 62 decibels and is considered normally acceptable. All of Zone II and III noise contours such as found near the impact area and field artillery firing points are well within the Camp Shelby boundaries, based on recent (1993) calculations which utilized the 1992-1993 training year actual ammunition expenditure. These recent data reflect the cessation of the M60A3 tank gunnery program in the fall of 1991, and the subsequent decrease in tank firing. Data previously available included the ammunition used for this special program, and previously-presented noise contour maps, such as those in the Draft EIS, showed Zone II contours within the installation boundaries except for three locations south and west of the impact area (Appendix I). Two of these areas were located near small communities. The most heavily populated of these was southwest of Paret Tower along FS 302, southeast of the impact area. While these residences remain the closest to the firing ranges, noise calculations based on the most current training levels do not show that they are within Zone II.

Two Wilderness Areas and the Black Creek Scenic River are located near Camp Shelby and may be affected by training noise levels under some atmospheric conditions. Leaf River Wilderness is southeast of the installation, near Leaf, and is 11 km (6¾ miles) from the nearest firing point. Black Creek Wilderness, south of Camp Shelby (near Janice), is at least 8 km (5 miles) from the nearest firing point (10 km from the impact area). The closest portion of the Black Creek Scenic River is approximately 2 km (1 1/4 miles) from the closest Camp Shelby firing point, and roughly 4 km (2 1/2 miles) from the edge of the impact area. Although no Zone II or III contours reach any of these areas, both the public and U.S. Forest Service personnel have voiced concern that weekend and night firing activities affect recreationists' enjoyment of solitude in these areas. Military pilots are warned that flying below 2,000 feet over wilderness areas is a violation of military and civil aircraft operations rules.

2.3.2.2 Army Aircraft and Vehicle Noise

The Army National Guard training activities described in Sections 1.2.1.1.4 generate noise. As with all similar training activities, the magnitude of this noise is greatest at the times when the largest numbers of vehicles and aircraft are concentrated at Camp Shelby, i.e., during the (summer) Annual Training periods, from about May 1 through August 31. Other locally large concentrations may be expected on weekends, from Friday afternoon through early Sunday morning, on about 14 weekends at other times of the year. Major contributors to this noise are vehicles such as tanks, trucks and armored personnel carriers, and aircraft, i.e., helicopters, under Army National Guard command. Broadly speaking, there are two contributors to this noise. First, transport and travel from the Cantonment Area and motor pools to and from the training areas causes the equivalent of "traffic noise" along these fixed routes. Second, the conduct of the maneuver exercises, themselves, results in local area noise in the immediate vicinity of the training activities. Existing intensive travel routes (tank trails) are shown in Figure 2-3A.

In addition to the noise of helicopter operations associated with travel to and from the training areas, some noise is generated through conduct of nap-of-the-earth (NOE) training activities. This training is conducted at very low altitude (at or below treetop level) and very slow speeds along three specified routes established for many years in the southeast part of the permit area. There was a fourth route which was abandoned when the Black Creek Wilderness was established, because it was believed to pass too close to that area. These routes are selected to intentionally avoid inhabited areas, lights, roads and other distracting features. The routes used and the noise zones resulting from their use are also shown on Figure 2-3A.

2.3.2.3 Air Force Aircraft Noise

Aircraft Firing Ranges: The Air Force and Air National Guard utilize Camp Shelby for practice bombing and gunnery, and for practice of air cargo parachute drops. (See Sections 2.1.1.1 and 2.1.1.3.2). The air-to-ground target ranges are operated up to seven days a week excluding normal holidays and deer hunting season. In recent years, usage has ranged between approximately 2,000 to 2,800 aircraft missions (sorties) per year, resulting in approximately 20,000 weapons delivery passes per year, an average of 80 per day for the 253 days the range is in use. A study prepared by the Air National Guard in 1991 developed noise contours for this activity. These are shown in Figure 2-3B.

Low Altitude Flight Routes: In their flights from operating bases to and from Camp Shelby, many of the Air Force and Air Guard aircraft follow designated routes within military operations areas (MOA). These routes, which are closed to civilian aircraft at the altitudes used by the Air Force, generally avoid inhabited areas, wildlife refuges, and other sensitive areas. Flights on these routes are not under the control of the Army National Guard personnel at Camp Shelby. No specific noise impact data are available for these routes.

2.3.3 Landforms

The topography of the area is generally rolling to hilly with rounded ridges and broad, mature drainages. The northwest, central and southeastern portions have steep slopes. However, the slopes are generally less than 6 percent and only occasionally greater than 10-12 percent (USDA-SCS, 1979). The elevation range between the ridges and valleys of the larger streams averages approximately 90 feet, and smaller streams are between 20 and 30 feet. Elevations range from 280 feet mean sea level (MSL) in the Cantonment Area to 150 feet MSL at the Black Creek Valley.

The major streams at Camp Shelby have broad rounded valleys with many small branching tributaries. Many of the larger creeks also have wide, flat, step-like terraces. The valleys are often at least one-half mile wide, and are subject to flooding during prolonged storms. Some of the slower moving streams, such as Cypress Creek, have developed swamps due to accumulated silt (Weatherford McDade, 1991).

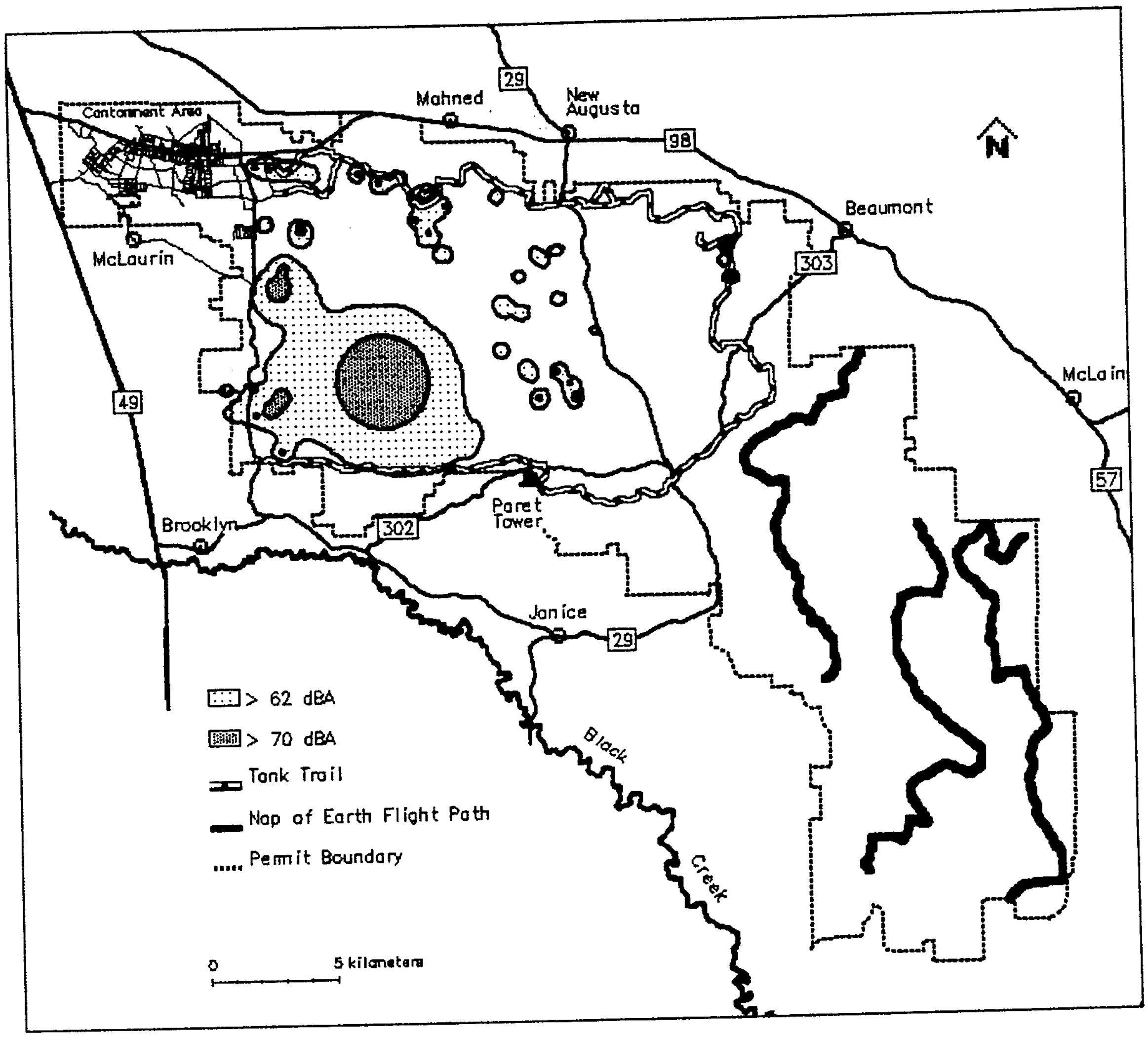

Figure 2-3A 1993 Army National Guard Training Activities Noise Contour for Camp Shelby

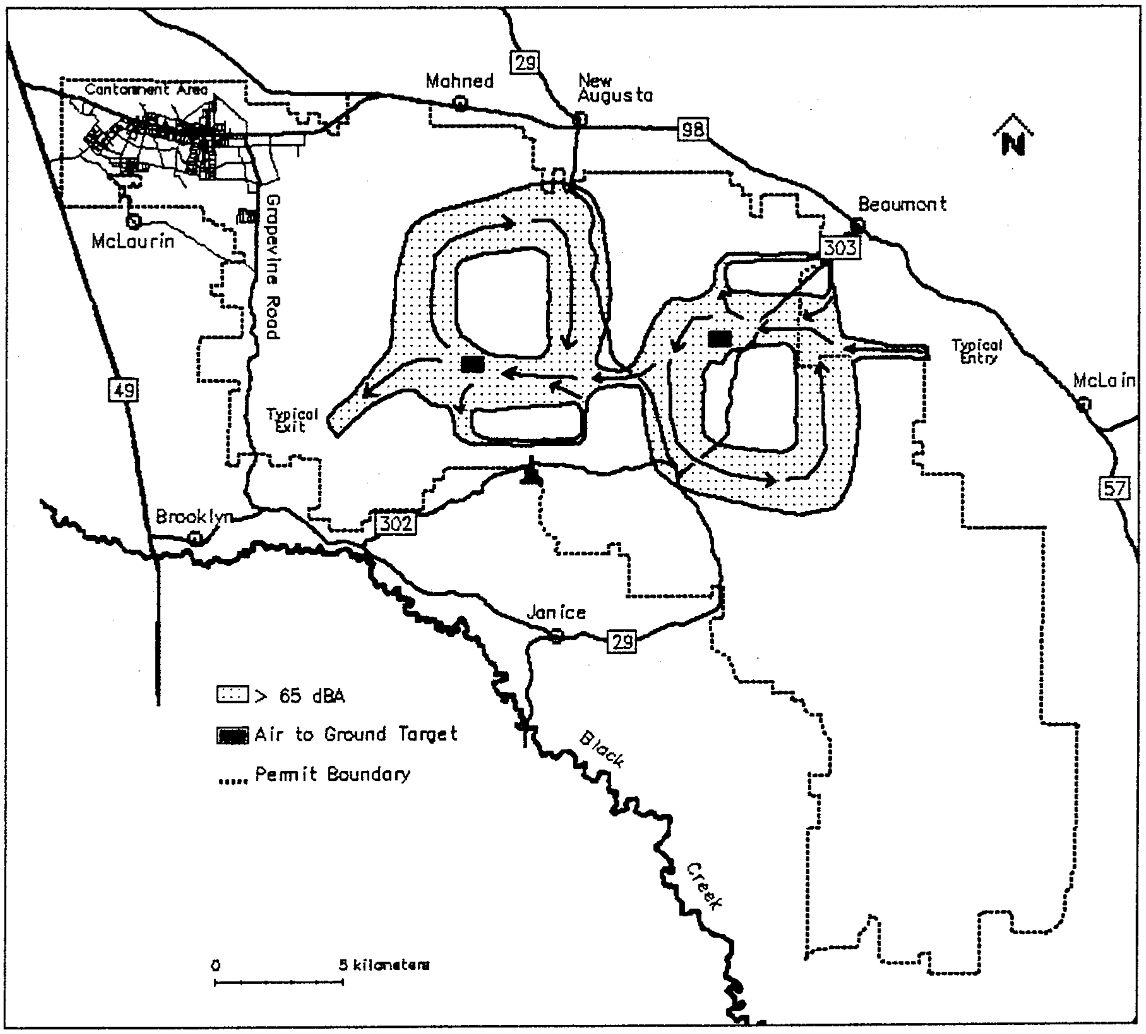

Figure 2-3B 1993 Air National Guard Training Activities Noise Contour for Camp Shelby

2.3.3.1 Geology

The exposed rocks in the region are mostly unconsolidated sedimentary rocks deposited by ocean and river currents. The geologic strata have a regional south-westward dip of 20-45 feet per mile.

Camp Shelby is underlain by the Citronelle, Hattiesburg, and Catahoula Formations. The Citronelle mainly consists of unconsolidated sands (1 to 150 feet thick) with some silty-clayey deposits and many scattered gravelly parts deposited by frequently migrating streams. Below this lies the Hattiesburg Formation which is dominated by light blue-grey to green deposits of silty-clay, with occasional fine sand deposits and clay beds six inches to five feet thick. The silty clay beds merge into sandstone beds (often 3 to 10 feet thick) of the underlying Catahoula Formation. Below the ledge-forming sandstone beds are layers of sand to silty-sand interbedded with silty-clay units, which form important aquifers (U.S. Department of Agriculture-Soil Conservation Service, 1979).

2.3.3.2 Minerals

Minerals of economic value which have been identified in the vicinity of Camp Shelby include lignite, natural gas, crude oil, gravel, and sand. Lignite occurs in thin seams at a depth of 2000 feet and is not likely to be developed (Weatherford McDade, 1991).

Mississippi's salt domes are located in the southern half of the state. These are immense columns of salt that have intruded from below into sedimentary rocks. Lying directly on top of the salt is a caprock, consisting of anhydrite overlain by gypsum and impure limestone. Thickness of the caprock ranges from a few feet to 1000 feet or more.

The Cypress Creek salt dome underlies much of the northern portion of the Camp Shelby permit area. Of course, the rock salt itself is a mineral material that is used by industry and for human consumption. In addition, major deposits of sulfur are found in the impure limestone of the caprock.

2.3.4 Soils

Most of the soils at Camp Shelby are formed from poorly consolidated rocks (mostly sandstone) and sediments deposited by wind and water, which are influenced by time, vegetation, climate, and topography. The majority of soils are classified as Ultisols, which are old, intensely weathered soils often found in a warm, wet climate. The high rainfall levels leach the clays from the upper soil horizons into the subsoil. Iron oxides are also translocated, giving the subsoil its characteristic red or yellow color. Although most of the nutrients are leached downward, Ultisols can be productive if properly fertilized (Hausenbuiller, 1985; Birkeland, 1984).

Most of the remainder of the soils on Camp Shelby are Alfisols, which have a less developed profile than Ultisols, indicating that less leaching has occurred. However, the upper soil layers have still been leached, creating light colored soils with limited amounts of organic

matter. Most of the clay has also been translocated into the subsoil (Hausenbuiller, 1985; Birkeland, 1984).

The four major soil associations found on Camp Shelby are described by the Forrest County Soil Survey (1979). They are, in order of prevalence (Weatherford McDade, 1991):

- McLaurin-Heidel-Prentiss Association (Typic Paleudult-Typic Paleudult-Glossic Fragiudult): These are found on gently sloping to steep slopes, and consist of well-drained and moderately well-drained sands and loams. They form the ridgetops (McLaurin and Prentiss) and steeper side slopes (Heidel).

- Benndale-McLaurin-Heidel Association, (all Typic Paleudults): They are gently sloping to steep, well-drained soils (sands and loams) found on ridges and upper parts of side slopes.

- Prentiss-Susquehanna-Falkner Association, (Glossic Fragiudult-Vertic Paleudalf-Aquic Paleudalf): They are loamy soils found in the southeastern area of the installation. The moderately well drained Prentiss and somewhat poorly drained Falkner are found on ridgetops, while the somewhat poorly drained Susquehanna are on the sloping lands.

- Poarch-Susquehanna-Saucier Association, (Plinthic Paleudult-Vertic Paleudalf-Plinthaquic Paleudult): These soils are located on the eastern edge of the permit area. The well drained loamy Poarch are found on the ridgetops, while the moderately well drained Saucier and somewhat poorly drained Susquehanna soils are on the side slopes.

2.3.5 Surface Water

2.3.5.1 Watersheds

Camp Shelby lies in the central part of the Pascagoula River Basin in the East Gulf Coastal Plain. The major drainages are the Leaf River, which flows parallel to the north and northeast boundary of Camp Shelby, and Black Creek which flows south of Camp Shelby. Leaf River joins the Chickasaway River south of the Greene County line to form the Pascagoula River; Black Creek enters the Pascagoula River just south of the Jackson County line. Much of Camp Shelby is drained by tributaries of Black Creek, including Chaney, Middle, Pierce, Cypress, and Hickory Flat Creeks. Areas along the northern border drain into tributaries of the Leaf River, including Caraway, Denham, Milley, Colman, Carter, and Little Creek. Most of the southeastern section of the base is drained by Whiskey Creek which flows directly into the Pascagoula River (Weatherford McDade, 1991).

2.3.5.2 Riverine and Palustrine Wetlands

The wetlands at Camp Shelby can be divided into the Riverine and Palustrine systems (Cowardin et al., 1979). The riverine system can be categorized into stream orders, following the Horton/Strahler method. New guidelines have been developed several times since 1970 and were most recently issued in August, 1991. The evaluations incorporated in the analyses of the detailed environment of the proposed project areas, found in Chapter 3, were prepared

according to the standards of the National Wetland Inventory in effect when the survey was performed in 1990. According to the Horton/Strahler method, a first order stream is the uppermost stream branch; thus, it has no tributaries. A second order stream is formed from two first order streams, a third order stream is formed when two second order streams join, etc. Land area occupied by streams within Camp Shelby is classified into five stream orders, as follows:

First Order	3002.7 Acres
Second Order	1121 Acres
Third Order	570 Acres
Fourth Order	240 Acres
Fifth Order	29 Acres
TOTAL	4967.7 Acres

The palustrine system (Figure 2-4) has been arbitrarily divided into five categories .

- Saturated >50 ft width: The soil is saturated to the surface for extended periods during the growing season, but the surface water is seldom present. The saturation zone is greater than 50 feet wide.

- Seasonally Flooded: Surface water is present for extended periods especially early in the growing season but is absent by the end of the season in most years. When surface water is absent, the water table is often near the land surface.

- Semipermanently Flooded: Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or near the surface.

- Permanently Flooded: Water covers the land surface throughout the year in all years. Vegetation is composed of obligate hydrophytes.

- Saturated <50 ft width: The soil is saturated to the surface for extended periods during the growing season, but the surface water is seldom present. The saturation zone is between 20 and 50 feet wide.

Saturated >50 ft width	9878 Acres
Seasonally flooded	4928 Acres
Semipermanently flooded	171 Acres
Permanently flooded	54 Acres
Saturated <50 ft width	763 Acres
TOTAL	15,794 Acres

These wetlands are generally dominated by herbaceous species that generally grow throughout the growing season. Sedges, rushes, grasses, forbs, and occasional shrubs are the predominant vegetation (Weatherford McDade, 1991).

Wetlands, especially palustrine areas, are important habitats for many animals species, partially due to the great vegetative diversity found there. The vegetation provides nesting habitat for songbirds as well as an abundant food source of insects, spiders, berries, and seeds. Wetlands are required by wading and shore birds, such as the Least Bittern (*Ixobrychus exilis*), Green Heron (*Butorides striatus*), Little Blue Heron (*Egretta caerulea*), Great Blue Heron (*Ardea herodias*), Yellow-Crowned Night Heron (*Nycticorax violacea*), and Common Snipe (*Capella gallinago*). Raptors and owls are also attracted to wetlands because of the abundance of small mammals (Weatherford McDade, 1991).

Wetlands also support many reptiles and amphibians, such as frogs, toads, and salamanders. Frogs and toads need quiet, open water for reproduction and early development, and salamanders require moisture throughout their lives. Cypress Creek Swamp is important habitat for the following species (Weatherford McDade, 1991).

Common Names	Scientific Names
Eastern cottonmouth	*Agkistrodon piscivorus*
glossy water snake	*Regina regida*
black racer	*Coluber constrictor*
banded water snake	*Nerodia fasciata*
mud snake	*Farancia abacura*
broad-headed skink	*Eumeces laticeps*
Southeastern skink	*Eumeces inexpectatus*
fence lizard	*Sceloporus undualtus*
rough green snake	*Opheodrys aestivius*
red-eared turtle	*Chrysemys scripta elegans*
stinkpot turtle	*Sternotherus odoratus*
Eastern mud turtle	*Kinosternon subrubrum*
common snapping turtle	*Chelydra serpentina*
sliders and cooters	*Chrysemys* spp.

2.3.6 Groundwater

All municipal and most industrial water in Camp Shelby is supplied by large aquifers containing good quality water. The sedimentary materials holding the fresh water range in age from Eocene to Recent, with the Miocene aquifers being the most important. The three important formations are the Catahoula Sandstone, the Hattiesburg, and the Pascagoula. The lower sand of the Hattiesburg Formation, averaging about 90 feet thick, is currently the most important water source for Camp Shelby. The upper sand layer is thinner and irregularly distributed, but it is speculated to be hydrologically connected to the lower sand layer. Other formations, such as the Catahoula Sandstone which lies below the Hattiesburg Formation, may also be utilized as auxiliary reservoirs through hydrologic connections to the lower sand layer of the Hattiesburg Formation (Weatherford McDade, 1991) (Appendix H).

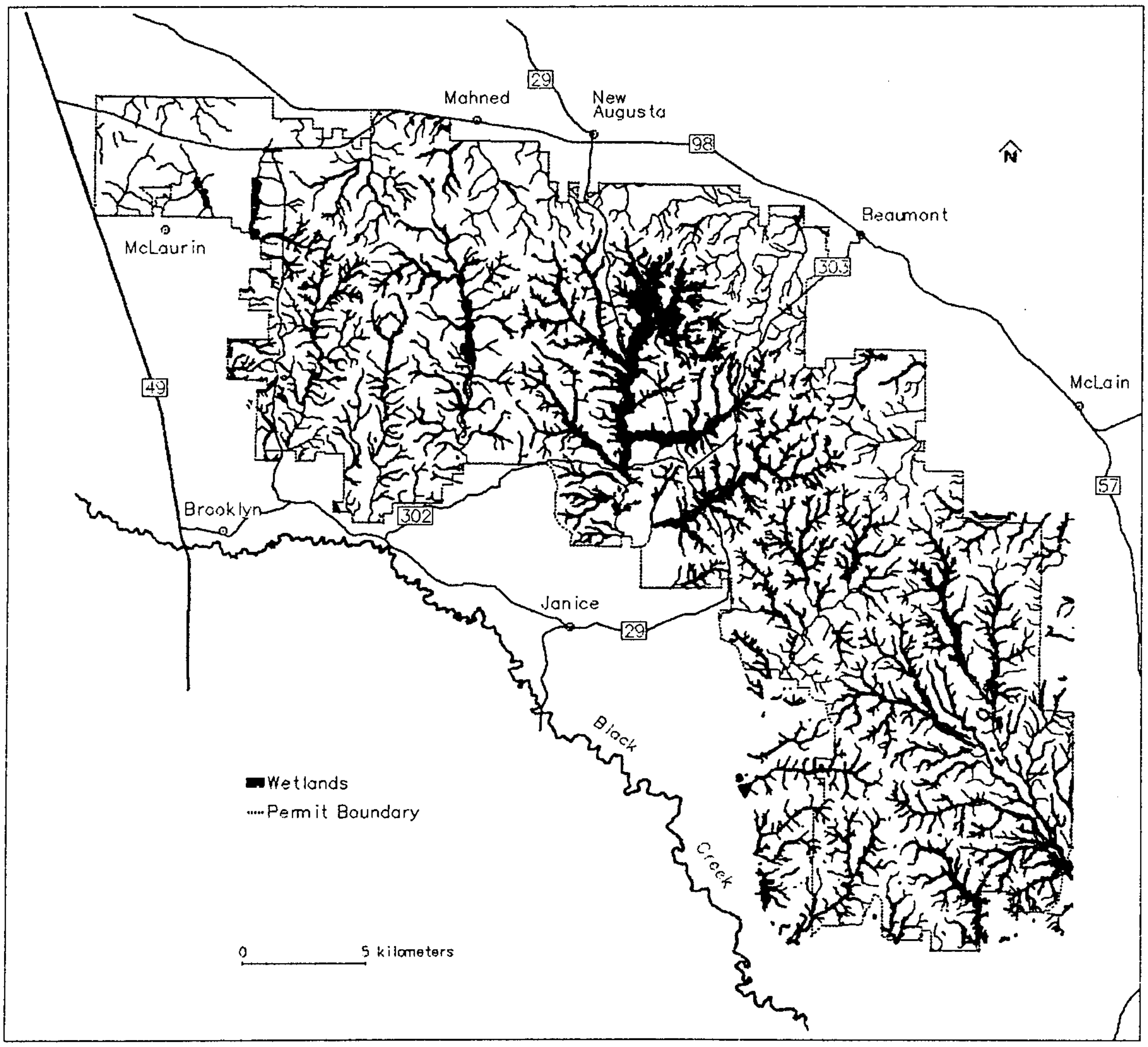

Figure 2-4 Wetlands and Streams Within Camp Shelby Training Area

2.4 Biological Environment

2.4.1 Vegetation

Most of Camp Shelby lies within the longleaf-slash pine belt of the southern mixed forest, although mixed pine and hardwoods are found in the north-central portion of the installation (Weatherford McDade, 1991), and bottomland hardwood forests occur in areas that flood periodically.

Longleaf pines (*Pinus palustris*) grow on the drier, upland sites, while slash pines (*P. elliotti*) are found on the moist sites. These species are generally found in association with other overstory (including loblolly and shortleaf pines) and understory species, but longleaf may occur in almost pure stands if the area is frequently burned. On very droughty sites, (such as the ridge tops) longleaf pine may be associated with a sparse mixture of turkey oak (*Quercus laevis*), bluejack oak (*Q. incana*), and blackjack oak (*Q. marilandica*).

On sites that are somewhat dry to somewhat moist, an understory consisting primarily of the Gallberry-Yaupon-Yellow Jessamine community, wax myrtle and blackberry (Weatherford McDade, 1991) is found. Smooth gallberry (*Ilex glabra*) is the dominant species, comprising 20-80 percent of the understory vegetation. Associated species include little bluestem (*Schizachyrium scoparium*), slender bluestem (*Andropogon tener*), low panicum (*Panicum* spp.), and grasslike forbs. Dogwood (*Cornus florida*), post oak (*Quercus stellata*), and southern red oak (*Q. falcata*) form a midstory below the longleaf or slash pine canopy. If not regularly burned, holly (*Ilex opaca*), persimmon (*Diospyros virginiana*), water oak (*Q. nigra*), and red maple (*Acer rubrum*), may become established in the area.

On the drier sites, grasses generally account for 60-90 percent of the understory vegetation, with legumes making up most of the remainder. The primary species are pinehill bluestem (*Schizachyrium scoparium* var. *divergens*), slender bluestem (*A. tener*), panicums (*Panicum* spp.), paspalums (*Paspalum* spp.), and carpet grass. Some shrubs, such as yaupon (*Ilex vomitoria*), and sparkleberry (*Vaccinium arboreum*), may occur singly or in small clumps.

The droughty sites on the ridgetops (with the oak midstory discussed above) have a sparse understory consisting of lichens, prickly-pear cactus (*Opuntia humifusa*), and occasional saw palmetto (*Serenoa repens*). The soils are usually deep (several feet thick) sand to loamy sand.

Slash pines were often planted in plantations established since the 1930's and are the dominant species on the moister habitats. They have understory communities ranging from the Smooth Gallberry-Yaupon-Yellow Jessamine type in the moist areas (described above) to a Wet Prairie-Savannah in wet areas. The Tall Gallberry-Wax Myrtle-Green Briar community is found in moist to wet areas, such as that found near drainages. These areas also support switchgrass (*Panicum virgatum*), toothache grass (*Ctenium aromaticum*, woolly panicum (*Panicum* spp.), cinnamon fern (*Osmunda cinnamomea*), and pinehill beakrush (*Rhynchospora* spp.). Fire is important in determining the density and composition of this community. If the area is not burned frequently, spicebush and fringetree may be found (Weatherford McDade,

1991); frequent burning causes the main species to sprout prolifically. A midstory of red bay, sweet bay, red maple, dogwood, and holly may be found.

The Wet Prairie-Savannah understory is common in low, wet coastal flatwoods, and is characterized by hydric species, including pitcher plants (*Sarracenia psittacinea*, *S. alata*), St. Johns wort (*Hypericum* spp.), rushes (*Juncus* spp.), sedges (*Carex* spp.), and water-tolerant grasses. The slash pine is often stunted due to the saturated soil conditions.

The drainages, and bottomlands or floodplain areas, which usually remain wet except during prolonged droughts, are dominated by Sweetbay (*Magnolia virginiana*)-Red Maple (*Acer rubrum*) forest types. They may have a sparse loblolly or slash pine overstory, but are dominated by the buckwheat tree (Black "ti-ti") (*Cliftonia monophylla*), sweetbay (*Magnolia virginiana*), and swamp cyrilla (*Cyrilla racemiflora*). Some areas have scattered hardwoods, such as water oak or yellow poplar.

Well-drained floodplains or moist stream terraces support more hardwoods (with or without interspersed pines) including southern red oak (*Quercus falcata*), cherrybark oak (*Q. falcata* var. *pagodifolia*), water oak (*Q. nigra*), white oak (*Q. alba*), sweet gum (*Liquidambar styraciflua*), yellow poplar (*Liriodendron tulipifera*), and hickory (*Carya* spp.). A floristic inventory was begun during Fall 1990 for Camp Shelby in conjunction with the implementation of the Land Condition-Trend Analysis (LCTA) Program. The inventory will be completed over the next two years. A list of plant species collected thus far appears in Appendix Q.

2.4.1.1 Proposed Botanical Areas

The National Forests in Mississippi Land and Resource Management Plan identified two areas within the permit area as potential botanical areas, the Loblolly Bay area and the Ragland Hills area. The 40 acre Loblolly Bay area is one of only two locations within the state which contains the Loblolly Bay (*Gordonia lasianthus*). The 286 acre Ragland Hills area is part of a larger tract of private land containing several species of plants unique to this part of Mississippi.

2.4.2 Agriculture

Agriculture practices on interspersed private land are basically confined to subsistence farming, commercial poultry production, and cattle grazing. Grazing leases are available for National Forest system lands, however, there are no current leases for lands within the Camp Shelby area. The last grazing lease expired in 1989 and no interest has been expressed since.

2.4.3 Forestry

Most of the Camp Shelby permit area was denuded of the longleaf pine forest from the early 1900's through the 1920's due to railroad logging, followed by frequent fires. "A sea of grass and stumps is broken only by small drains and remnant 'whips'" (isolated trees too small to cut when the original forest was logged). By the 1930's, this described the condition

of the land (Wahlenberg, 1946) and how the Forest Service found it when land purchase program began to form the De Soto National Forest in 1933.

The ability of longleaf pine seedlings to remain for years in the "grass" stage, virtually invulnerable to fire, coupled with a massive planting effort by the Civilian Conservation Corps has resulted in basically the even-aged stand of 55 year-old pine seen today. Longleaf pine makes up about 53 percent of the forested area and 63 percent of the pine within the boundaries of Camp Shelby. The slash pine stands on the uplands were also planted during this time. During the 1950's extensive planting of slash pine occurred on the poorer drained flats. In the 1940's as fire protection improved on National Forest lands, loblolly pine invaded many of the poorer stocked longleaf sites and better drained sites along stream courses.

In the four year period 1937 through 1940, only 210 thousand board feet (210 MBF) of timber was cut from the Camp Shelby area of the De Soto National Forest. 7600 tons of stumpwood were also sold during this time. Since then, the naval stores industry (stumpwood) has been replaced with pole-piling, sawmill, plywood, and pulp mills in the 5 county area surrounding Camp Shelby. In Fiscal Year 1990 the Black Creek Ranger District sold 17,758 MBF of sawtimber and pulpwood having a value of $2,206,000 from the same Camp Shelby area. Many of the nationally important forest products industry companies are represented by mills within economical hauling distance of the Camp Shelby permit area.

The De Soto National Forest is managed for longleaf (*Pinus palustris*), loblolly (*P. taeda* L.), shortleaf (*P. echinata* Miller), and slash pines (*P. elliotti* Engelm.), and hardwoods (Weatherford McDade, 1991). The pine species are used for construction, poles, pilings, lumber, plywood, and pulpwood. Slash and longleaf pines are the dominant species for which the forest is managed.

Most of the area is managed on an even-aged basis, using both natural and artificial planting methods of regeneration. An increased harvest of pine sawtimber is planned, with a final product size ranging from 10"-14" dbh (diameter at breast height) for wet, poorly-drained soil near the pitcher plant bogs to 14"-20" dbh for most other pine species. Hardwoods will be managed for 12"-18" dbh in waterlogged areas and 16"-30" dbh for other areas.

A prescribed burning regime based on a 3-5 year interval between burnings is suggested as a part of the pine management plan. The forest management plans also include wildlife considerations, especially for threatened and endangered species, such as the red-cockaded woodpecker and gopher tortoise which may require more frequent burning.

2.4.4 Fish and Wildlife

2.4.4.1 General

Areas of open to relatively dense pine forest interspersed with smaller stands of bottomland hardwood forest, wetlands, and cutover areas, coupled with differing types and intensities of land use, provide habitat on Camp Shelby for riparian, forest interior, open meadow, and edge associated wildlife species. Indigenous species diversity within habitat types on Camp Shelby seems to be representative of the region and comparable to similar areas of the De Soto National Forest. Most of the songbird and small mammal species known to occur in the region have been documented during the initial Land Condition-Trend Analysis (LCTA) surveys conducted in 1991 and 1992 on Camp Shelby. Tazik and others (1992) describe the purpose of and standardized field methods utilized in these surveys. Lastly, Weatherford McDade LTD. (1988) provided additional insight into the wildlife and wildlife/plant community associations on Camp Shelby west of Highway 29, with similar associations being expected in comparable areas east of Highway 29 (see also Section 2.4.1).

2.4.4.2 Mammals

Forty-six species representing 17 families of mammals are known to occur in the Camp Shelby/De Soto National Forest region (Appendix Q). The white-tailed deer (*Odocoileus virginianus*), eastern cottontail (*Sylvilagus floridanus*), raccoon (*Procyon lotor*), bobcat (*Felis rufus*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), muskrat (*Ondatra zibethicus*), beaver (*Castor canadensis*), and striped skunk (*Mephitis mephitis*) are some of the most commonly observed species. Coyotes (*Canis latrans*) and armadillos (*Dasypus novemcinctus*), once uncommon in the region, are now frequently observed on Camp Shelby.

The nutria (*Myocastor coypus*), a large semiaquatic rodent introduced from South America to the southeastern United States as a potential furbearer, has become well-established in many marshes and waterways, and may be expected to occur in the area. Abundant, but less conspicuous small-mammal species in the Camp Shelby area include the cotton mouse (*Peromyscus gossypinus*), hispid cotton rat (*Sigmodon hispidus*), and least shrew (*Cryptotis parva*).

2.4.4.3 Birds

The vegetative diversity at Camp Shelby provides habitat for many avian species, ranging from ground-dwelling game birds and wading birds to raptors, hummingbirds and the endangered red-cockaded woodpecker. The most frequently hunted upland game birds are the wild turkey (*Meleagris gallopavo*), northern bobwhite quail (*Colinus viginianus*), and mourning dove (*Zenaida macroura*) (Weatherford McDade, 1991). The wood duck (*Aix sponsa*) and mallard (*Anas platyrhynchos*) are the most commonly observed waterfowl.

In addition to the year round resident birds, neotropical migrants (birds that breed in North America but spend their non-breeding periods in Central and South America) heavily utilize the De Soto National Forest and Camp Shelby each spring. Of the 70 bird species observed

on LCTA plots in the spring of 1991 and 1992 (Appendix Q), 41 percent are considered class "A" neotropical migrants and an additional 20 percent are class "B" neotropical migrants (Partners in Flight 1991 Annual Report). Class "A" species are those that breed in North America and spend their nonbreeding period south of the United States, while class "B" species breed and winter extensively in North America but contains some populations that winter south of the United States. Considering that neotropical migrants commonly comprise 65-85 percent of the breeding birds in eastern forests (Morse, 1980), a continuation in the national trend towards decreasing abundance is likely to limit opportunities for recreational bird-watching, biological research studies, and future management options. A recent checklist of the neotropical migrants and other bird species from the Camp Shelby/De Soto National Forest area is in Appendix Q.

2.4.4.4 Reptiles and Amphibians

Numerous reptiles and amphibians live on Camp Shelby, including salamanders, newts, frogs, toads, turtles, skinks, and snakes. In addition, the federally listed gopher tortoise and eastern indigo snake are both known to occur on the installation (see Section 2.4.5 below). Moist areas, such as creeks, ponds, and bayheads, generally support larger populations of salamanders, newts, frogs, and some turtles. In contrast, many skinks and snakes prefer drier upland areas. Weatherford McDade (1988) compiled a list of reptiles and amphibians known or thought to occur on Camp Shelby (Appendix Q). In addition to this list, several other species known, or thought to occur at Camp Shelby have been added. These include the dusky gopher frog, chicken turtle, rainbow snake, mole snake, and scarlet kingsnake (Ken Gordon, personal communication, 1993).

2.4.4.5 Fish

Fifty-one species of fish representing thirteen families, including bluegill, sunfish, bass, darters, topminnows, and shiners have been found in streams, lakes, and ponds in Forrest and Perry Counties (Mississippi Museum of Natural Science, 1991). Many of these species undoubtedly occur in suitable waters on the installation. Minnows, shiners, and darters (e.g., *Notropis* spp., *Fundulus* spp., and *Etheostoma* spp.) can potentially be utilized as bioindicators of aquatic habitat quality (Pearson et al., 1987). A list of fish species from the Camp Shelby/De Soto National Forest area can be found in Appendix Q.

2.4.4.6 Invertebrates

Although the invertebrates of Camp Shelby have not been well documented, Howell and Ross (1982) found 121 taxa in Black Creek, south of the base. A similar community is probably found on Camp Shelby. Diptera, Ephemeroptera, Coleoptera, and Plecoptera were the predominant orders reported. Aquatic invertebrates respond quickly to environmental changes, and are frequently used as indicators of environmental degradation (particularly sedimentation) of an area.

2.4.5 Threatened, Endangered, and Sensitive Species

2.4.5.1 Wildlife

Camp Shelby is within the historical ranges of several federally listed threatened or endangered animal species (Figure 2-5). They are the red-cockaded woodpecker, Bachman's warbler, eastern indigo snake, gopher tortoise, Florida panther, red wolf, American peregrine falcon, Louisiana black bear, bald eagle, and American alligator. Of these ten species, the red wolf, Bachman's warbler, and the panther no longer occur in Mississippi. Furthermore, the recently listed (threatened) yellow-blotched map (sawback) turtle and the Gulf sturgeon, while not known to occur on Camp Shelby, are known to occur in large streams (e.g., the Leaf River) in close proximity to the installation. In addition, the black pine snake, Camp Shelby burrowing crayfish, and dusky gopher frog are candidate species for federal listing, and are found on or near Camp Shelby. On the state level, the rainbow snake, southern hognose snake, and Bewick's wren are listed as endangered by the Mississippi Department of Wildlife, Fisheries and Parks. All of the following federally listed species are also state listed. For a discussion on the threatened, endangered, and sensitive (TE&S) plant species occurring in the Camp Shelby area please see Section 2.4.5.2.

2.4.5.1.1 Federal Endangered Species

- Red-cockaded woodpecker (*Picoides borealis*): The decline of the red-cockaded woodpecker (RCW) has been attributed to past timber management practices throughout its range, cutting of the original virgin forest, its specific habitat requirements, and relatively low productivity.

More specifically, genetic and demographic problems associated with colony isolation and foraging area fragmentation (*Implementation Guide for the Management of the Red-cockaded Woodpecker During the Interim Period*, 1990) continue to pose a threat to the woodpeckers existence. Open stands (50-80 square feet of basal area per acre) of mature, southern pines (a minimum of 60 years old) are preferred for colony sites, while younger stands of pine (>5 inch diameter breast height or DBH) are adequate for foraging. Fifteen red-cockaded woodpecker colony sites (inactive) are known to occur on Camp Shelby (Schnell and Chapman, 1991). A ground and aerial survey was conducted in 1991 (Appendix N) to try and locate any active red-cockaded woodpecker trees, but none were found (Schnell and Chapman, 1991). The U.S. Forest Service records for the Black Creek District also show no remaining active colonies on Camp Shelby.

The De Soto population occurs in longleaf pine on three Ranger Districts. According to U.S. Forest Service records there are seven active colonies on the Biloxi District, none on the Black Creek District, and four on the Chickasawhay District. These small isolated populations are vulnerable because sub-populations are widely separated, and have low numbers of active colonies that are widely scattered and unable to exchange genetic material. The lone active colony on the Black Creek (outside the Special Use Permit area) went inactive in 1993 when the birds dissappeared and could not be located in the adjacent area.

Cavity competitors and undesirable midstories are also problems in some colony sites. In the late 1970's, there were over 20 active colonies of RCW on the Black Creek Ranger District. Hurricane Fredrick destroyed nine active trees in 1979, and by 1983 the district only had ten active colonies. By 1991, there was just one active colony.

Burning of the longleaf forests on the De Soto creates an open habitat, but a lack of older trees, damage from hurricanes, and low RCW populations have not expanded the RCW there. Recent augmentation, the bringing in of juvenile female birds, was successful in four out of ten attempts.

- Florida panther (*Felis concolor coryi*): There have been no authenticated records of panthers (cougars) in Mississippi since the 1800's (Wolfe, 1971). Several unconfirmed sightings, however, have been reported in the Pascagoula swamp area (George and Jackson Counties) in recent times. No records exist from the Camp Shelby area.

- Red wolf (*Canis rufus gregoryi*): Red wolves have been reported from Jefferson, Franklin, Claiborne, Copiah (Young, 1944), and Harrison Counties (Wolfe, 1971). No records exist from the Camp Shelby area and this species is now thought to have been extirpated from Mississippi.

- American peregrine falcon (*Falco peregrinus anatum*): Observed in the area as a migrant, with no nesting known to occur on Camp Shelby.

- Bachman's warbler (*Vermivora bachmanii*): This species typically breeds in wooded, thicket-grown river swamps and may occur as a migrant. This bird is considered the rarest warbler of North America, but is presumed extinct by some persons (Harris, 1988).

- Bald eagle (*Haliaeetus leucocephalus*): Although occasionally observed along the Leaf River, this species is considered an occasional transient. No nests have been found within Camp Shelby or the De Soto National Forest to date.

2.4.5.1.2 Federal Threatened Species

- Gopher tortoise (*Gopherus polyphemus*): The gopher tortoise prefers well-drained, sandy or gravelly soils greater than 1 meter in depth in open stands of timber (maximum crown closure approximately 60 percent) along ridges; sunny areas to nest and hatch young; and early successional, low-growing vegetation (Wester and Swing, 1990). Priority soils generally have these features, and therefore have received a greater degree of protection. The Gopher Tortoise Recovery Plan defines recovery as gopher tortoise occupation of priority soils (i.e., those with the above characteristics) at the rate of five burrows per hectare (about two per acre). Surveys are ongoing to locate and determine active/inactive status of gopher tortoise burrows.

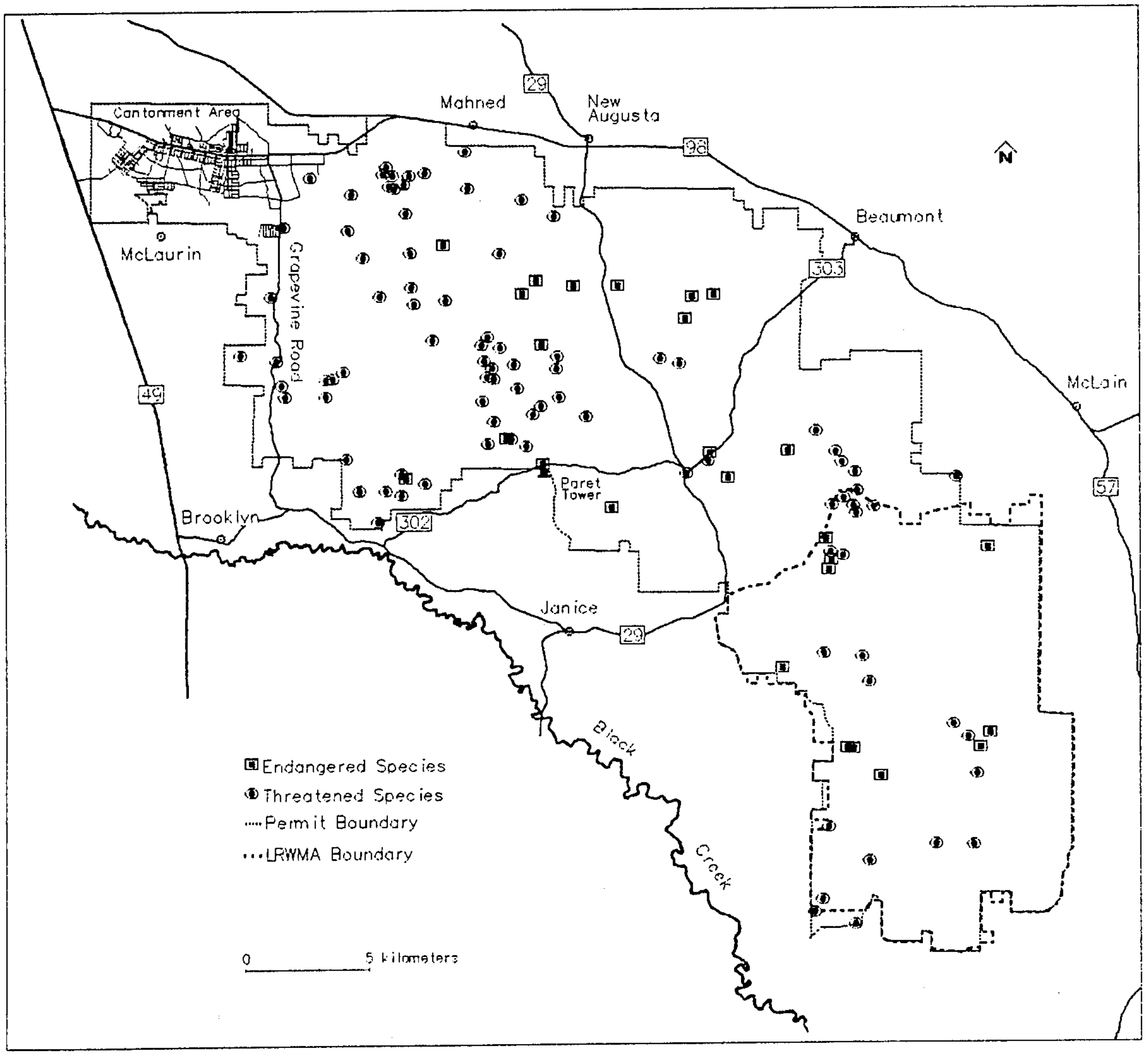

Figure 2-5 Known Locations, Threatened and Endangered Species on Camp Shelby
Endangered Species Symbols Represent Inactive RCW Colony Sites

Factors responsible for the decline in the population are past forestry practices (USFWS Biological Opinions, 1989, 1992, 1993 are found in Appendix L), a lack of regular burning interval (which maintains appropriate vegetation), structural alterations of the habitat, and capture by man for food, pets, and sale. Approximately 2100 active burrows (USFWS Biological Opinion, 1993) are known to be located on Camp Shelby. While priority soils are important to the recovery of the gopher tortoise, analysis of the current data reveals that priority soils are no more likely to contain gopher tortoise than non-priority soils. The former Training Area 44, more than 2,200 acres, was set aside by the National Guard as a refuge for the tortoise in 1989 and is off limits to military and civilian off road vehicles. Both active and abandoned burrows of the gopher tortoise are heavily utilized by a variety of vertebrates and invertebrates throughout the year.

- Eastern indigo snake (*Drymarchon corais couperi*): The eastern indigo snake has a commensal relationship with the gopher tortoise and often inhabits abandoned tortoise burrows. It became threatened because of habitat destruction or alteration, and excessive pet-gathering. There have been a couple of confirmed sightings in recent times, one of which is from Camp Shelby. This species is considered rare on the installation at best, and thought by some to be extirpated (Weatherford McDade LTD., 1991).

- Yellow-blotched map (sawback) turtle (*Graptemys flavimaculata*): This species requires riverine habitat with moderate current, sand or clay substrate, sand bars or beaches for nesting, and snags or other structures for basking and protection from predators (*Endangered Species Technical Bulletin*, Vol. XV, No. 8, 1990). Yellow-blotched sawback turtles are endemic to the Pascagoula River system in southeastern Mississippi, and known to occur from Black Creek upstream and downstream of Camp Shelby (Mississippi Deptartment of Wildlife, Fisheries and Parks, Ken Gordon, personal communication, 1993). However, this species has not yet been found to occur in waters on Camp Shelby. Predation by humans and habitat destruction, particularly dredging, flood control practices, and degradation of water quality, pose the most serious threats to the species' existence.

- Gulf sturgeon (*Acipenser oxyrinchus desotoi*): The Gulf sturgeon is an anadromous fish which migrates from salt water into large Gulf coastal rivers to spawn and spend the warmer months. The majority of its life is spent in fresh water. Sturgeon virtually disappeared throughout their ranges at the turn of the 20th century as a result of over-exploitation. There was a directed fishery for sturgeon in Alabama and Florida, while there is no record of a directed commercial fishery in Mississippi or Louisiana. Major limiting factors are thought to include barriers (dams) to historical spawning habitats, loss of habitat, poor water quality, and overfishing. Timing, location and habitat requirements for Gulf sturgeon spawning are not well documented, although it appears that they favor deep river holes and areas near springs and spring runs. Sturgeon eggs are adhesive, thus requiring hard substrate (e.g., rock, snags) for attachment and successful development. Several Gulf sturgeon were collected in the lower three miles of the Pascagoula, Escatawpa, and Chickasawhay Rivers in 1993. One fish was radio-tagged and was last documented in the Leaf River near McClain, Mississippi. Other Gulf sturgeon collected in the Pascagoula River basin have been primarily located near the mouth of the Pascagoula

River (U.S. Fish and Wildlife Service, 1993). This species has not been found to occur in the streams that exist on Camp Shelby.

- Louisiana black bear (*Ursus americanus lutealus*): Although no recent sightings have been reported in the Camp Shelby area, bears have wandered near to or within the permit area from the Pascagoula River Game Management Area (20 miles Southeast of Camp Shelby), where a small breeding population is known to exist.

- American alligator (*Alligator mississippiensis*): Populations are stable, but it is listed as threatened due to similarity of appearance with the endangered American crocodile (*Crocodylus acutus*). Alligators are known to occur on the larger river systems in the De Soto National Forest and in the Water Prong/Whiskey Creek drainage on Camp Shelby.

2.4.5.1.3 Federal Proposed (Candidate) Species

- Black pine snake (*Pituophis melanoleucus lodingi*): The black pine snake prefers sandy sites in longleaf pine forests. This snake has been collected in Forrest and Perry Counties and is known to occur on Camp Shelby in at least three locations.

- Dusky gopher frog (*Rana areolata sevosa*): At present, there are only two locations where this species is known to occur. Breeding ponds in Mississippi have been found in Harrison County only. A survey of all upland, ephemeral ponds within the Camp Shelby area is needed to verify its presence or absence within these habitat locales.

- Camp Shelby burrowing crayfish (*Fallicambarus gordoni*): Endemic to Mississippi and known only from Camp Shelby, this species is generally confined to the upper reaches of the Cypress Creek watershed and is strongly associated with pitcher plant bogs (Fitzpatrick, 1991). The specific sites Fitzpatrick surveyed and those in which this species was collected are listed in Appendix E.

2.4.5.1.4 State Endangered Species with no Federal Status

These species have been identified by the Mississippi Natural Heritage Program and, like the Federally listed species, are protected from collection, harassment, etc., by state law.

- Bewick's wren (*Thryomanes bewickii*): Bewick's wren occurs on Camp Shelby but only as a migrant and winter resident.

- Rainbow snake (*Farancia erytrogramma*): This snake has been found in Forrest and Jackson Counties, and typically occurs in the longleaf pine belt, in or near water.

- Southern hognose snake (*Heterodon simus*): This snake inhabits sandy and relatively open areas. Although none have been confirmed on Camp Shelby, their occurrence is possible.

2.4.5.1.5 Forest Service Sensitive Species

A sensitive species is one that has been identified by the Regional Forester for which population viability is a concern, as evidenced by:

(1) Significant current or predicted downward trends in population numbers or density.

(2) Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution (U.S. Forest Service Manual, 2670).

Refer to Figure 2-6 for known locations of sensitive species.

- Bachman's sparrow (*Aimophila aestivalis*): These sparrows typically inhabit open pastures, open woodlands, and dense grasslands with small trees. Bachman's sparrows have been observed on a total of 18 of the U.S. Army's LCTA permanent research sites located throughout Camp Shelby during the 1991 and 1992 spring surveys.

- Pine woods snake (*Rhadinaea flavilata*): A secretive snake found under logs, leaves, or loose soil, but most frequently under bark in the decaying interiors of pine logs and stumps. These snakes have been found in Jackson, Forrest, Perry, and Harrison Counties.

- Lavender burrowing crayfish (*Fallicambarus byersi*): This species is highly associated with pitcher plant communities, and has been documented from Stone and Harrison Counties.

- Spiny-tailed crayfish (*Procambarus fitzpatricki*): These crayfish have been found in Harrison, Jackson, George, and Stone Counties, and may occur on Camp Shelby.

- Mobile crayfish (*Procambarus lecontei*): These crayfish have been found in George and Jackson Counties, and may occur on Camp Shelby.

- Bluenose shiner (*Notropis welaka*): Recorded from Pierce's creek in the maneuver area (Perry County) and are found in streams with abundant aquatic vegetation.

2.4.5.1.6 Special Interest Species

For purposes of this Final EIS, a special interest species is one that should be studied and monitored, but is not necessarily on the official Natural Heritage list.

- Golden eagle (*Aquila chrysaetos*): This species may occur as a summer transient or migrant. No nests have been found within Camp Shelby or the De Soto National Forest.

- Chicken turtle (*Deirochelys reticularia*): These turtles have been found in Jackson, Forrest, Harrison, and Perry Counties, and are known to occur at Camp Shelby.

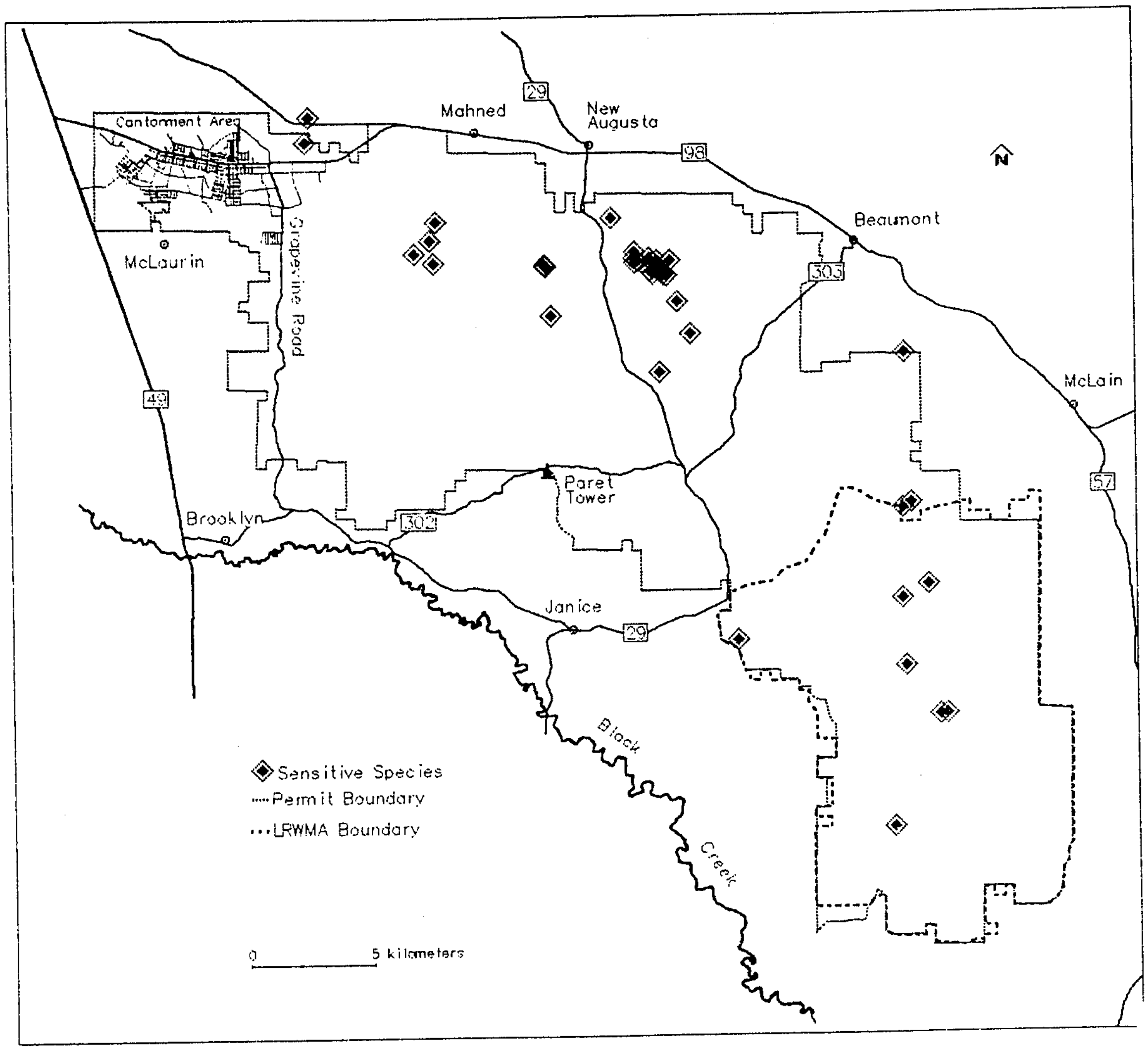

Figure 2-6 Known Locations, Sensitive Species

- Speckled burrowing crayfish (*Fallicambarus danielae*): These crayfish have been found in Jackson County, and are known to occur at Camp Shelby.

- Mole snake (*Lampropeltis calligaster rhombomaculata*): These snakes have been found in Jackson and Forrest Counties, and may occur at Camp Shelby.

- Scarlet kingsnake (*Lampropeltis triangulum elapsoides*): These snakes have been found in Forrest and Stone Counties, and may occur at Camp Shelby.

- Diamondback terrapin (*Malaclemya terrapin pileata*): These turtles have been documented from Jackson and Harrison Counties, and are known to occur in the Pascagoula River Marsh.

- Eastern coral snake (*Micrurus fulvius fulvius*): This snake has been found in the Black Creek District of Forrest County, and has also been documented from Jackson County.

- Oldfield mouse (*Peromyscus polionotus*): This mouse is known from Lowndes, Tishomingo, Jasper, and Lauderdale Counties (Jones and Carter, 1989), but is not known to occur at Camp Shelby.

- Southeastern shrew (*Sorex longirostris longirostris*): This shrew is known from Jones, Wayne, and Franklin Counties (Wolfe, 1971), and has been documented at Camp Shelby (Weatherford and McDade, 1991).

2.4.5.2 Plants

No federally listed threatened or endangered plant species are known to occur on Camp Shelby. However, the following species found in the De Soto National Forest are currently listed by the Regional Forester as being sensitive.

Common Name	Scientific Name	Typical Location
Coastal plain foxglove	*Agalinis aphylla*	"Pitcher Plant Bogs"
Myrtle holly	*Ilex myrtifolia*	"Pitcher Plant Bogs"
Pine barrens prairie clover	*Petalostemon gracilis*	Seasonally wet areas in pine savannahs and flatwoods
Silky Camellia	*Stewartia malacodendron*	
Incised groovebur, agrimony, cocklebur, needle-grass	*Agrimonia incisa*	Sandy open pine-oak forest

Southern 3-awned grass, wire-grass	*Aristida simpliciflora*	Longleaf pine-wiregrass savannahs
Spreading pogonia, rosebud orchid	*Cleistes divaricata*	Pine savannahs and flatwoods, bogs, swamps
Texas pipewort	*Eriocaulon texense*	Bogs, swamps, moist pinelands
Loblolly Bay	*Gordonia lasianthus*	Evergreen shrub bogs, pond-cypress depressions, swamps
Juneberry holly, sarvis holly	*Ilex amelanchier*	Stream banks through flat-woods, titi swamps, bogs
Bog button	*Lachnocaulon digynum*	Seepage bogs, wet exposed sands, pond edges
Bog spicebush	*Lindera subcoriacea*	Bogs, especially with deep peats, bay heads
Big floating heart	*Nymphoides aquatica*	Ponds and swamp forests, lower plain
Naked-stemmed panicum	*Panicum nudicaulis*	Sphagnum bogs
Chapman's butterwort yellow fringeless orchid	*Pinquicula plainifolia*	Bogs, flatwood depressions, ditches, pond margins
Southern yellow fringless orchid	*Platanthera integra*	Boggy depressions in savannahs, flatwoods, prairies; edges of shrub bogs
Spine palm, needle palm	*Rhapidophyllum hystrix*	Moist to wet flood plains of small woodland streams; seepage areas in ravines and bayheads
Large beaked rush	*Rhynchospora macra*	Bogs, wet pine savannahs and flatwoods
Harper's yelloweye grass	*Xyris scabrifolia*	"Pitcher Plant Bogs" Moist to wet sandy peats of bogs and seepage areas

The "Pitcher Plant Bog" is the grass-sedge-shrub community dominated by *Sarracenia*. These unique areas form where sandy soils rich in organic matter are located on a perched water table, such as that found in the upper reaches of Cypress Creek.

2.4.6 Leaf River Wildlife Management Area (LRWMA)

2.4.6.1 Background

To properly understand the cultural and ecological history of the LRWMA and relate this information to the proposed actions it is necessary to frame this section in a way that is not narrowly limited to the LRWMA. The ecological and cultural history of the LRWMA can only be developed within a broad framework that includes much of southern Mississippi. Many of the referenced documents used in this section were written well before the establishment of the LRWMA and cover areas in and around what eventually became the LRWMA. Therefore, it may appear to some that a specific treatment of the LRWMA is lacking but this is due to the nature of available historical records.

Four general areas are covered within this section including a limited discussion of the early inhabitants of the area, an extensive treatment of the historical ecology of southern Mississippi primarily developed from the writings of J.F.H. Claiborne in 1841-1842, the fire ecology of coastal plains pine forests, and the origin and history of what is now the Leaf River Wildlife Management Area.

2.4.6.2 Introduction

The Leaf River Wildlife Management Area (LRWMA) is located in the east central portion of the De Soto National Forest (Black Creek Ranger District, Perry and George Counties, Mississippi). The LRWMA wildlife populations are managed by the Mississippi Department of Wildlife, Fisheries and Parks under a Memorandum of Understanding with the U.S. Forest Service. This type of agreement has existed since 1939.

The 43,535 acres that now constitute the LRWMA has a long and varied cultural, ecological, and management history. The LRWMA forms portions of both the Black Creek and Leaf River watersheds but is primarily in the latter. The Leaf River joins the Chickasawhay to form the Pascagoula River at Merrill, Mississippi. Black Creek and Red Creek meet and empty into the Pascagoula River, further to the south. The Pascagoula River reaches the Mississippi Sound at Pascagoula, Mississippi.

2.4.6.3 First Inhabitants

The Pascagoula River country was previously inhabited by mound builders. The French that first came to southern Mississippi indicate that four native tribes were found to be living in the region of the Pascagoula River. They included the Biloxi, Pascagoula, Moctobe, and Capinans (Cain, 1953). The Biloxi lived along the Gulf coast near the mouth of the Pascagoula and northward along the river approximately 25 to 40 miles. Above this point, the Pascagoula appear to have utilized the river and adjacent lands as far north as the confluence of the Chickasawhay and Leaf Rivers at what is presently Merrill, Mississippi (Cain, 1953). The other two tribes were minor and little information is know about them other than the belief that they were actually subgroups of the Pascagoula. Cain (1953) draws on French records describing a large Pascagoula village approximately 60 miles up the Pascagoula, at what was then known as Brewtown, supporting some 450 inhabitants in 1698.

This would place the village in the vicinity of Beaumont, Mississippi. By 1770, the village was reduced to 20 families due to heavy losses from European diseases. The Pascagoula eventually moved their main village south near Gautier along the coast and then to Louisiana when the British took control of the area in 1764.

2.4.6.4 Historical Ecology

Historical descriptions of the ecology of southern Mississippi are relatively scarce. Much of the information available today is derived from the writings of J.F.H. Claiborne. Claiborne traveled through southern Mississippi in 1841 and recorded information regarding the flora, fauna, and settlement of the area. Claiborne's 'sketches' were published in 1841 and 1842 in the *Natchez Free Trader and Gazette* and were subsequently reproduced by the Mississippi Historical Society as *A Trip Through The Piney Woods* (Riley, 1906). His account is thought to be the best portrayal of the conditions found in "the great pine region of Mississippi in the 1840s" (Riley, 1906).

It cannot be positively determined that Claiborne traveled within the boundary of what is now the LRWMA, but he certainly moved between Williamsburg, Ellisville, Winchester, Leaksville, and Augusta (New Augusta), Mississippi. At one point he describes crossing the Leaf River after leaving Ellisville (probably at Palmers Crossing) on his way into Perry County (Riley, 1906). Although the places Claiborne identifies by name in his travels are north of the LRWMA, these areas would have been, ecologically speaking, indistinguishable from it.

Claiborne's writings included general observations regarding natural resources (timber, flowering plants, wildlife), industry, agriculture, and settlement. Claiborne described in detail the area south of Ellisville (Jones County). The land was sparsely settled and "adapted chiefly to grazing" (Riley, 1906). The area, much of which belonged to the government "is covered exclusively with the longleaf pine; not broken, but rolling like the waves in the middle of a great ocean." Claiborne continued in his observations ... "the grass grows three feet tall and hill and valley are studded all over with flowers of every hue. Thousands of cattle are grazed here for market. The unbroken forests abounded with game. The red deer troop along by dozens; for miles the wild turkeys run before you in the road; and the sharp whizzing of the startled partridge is constantly on the ear. But for this panorama of life, the solitude of a ride through this region would be painful. The houses on the road stand from ten to twenty miles apart" (Riley, 1906). Claiborne noted that "the aspect of the country varied very little" (Riley, 1906) an indication of the relative ecological homogeneity of the counties in which he traveled.

It is also readily apparent from Claiborne's writings that the great pine belt was not being used for its timber but primarily for agricultural purposes, although he realized that the future economy of the piney woods would be in timber. Cattle were grazed throughout the region and were marketed, along with other agricultural items, in nearby population centers. The cattle were grazed on the "luxuriant growth of grass" beneath the extensive pine forests (Riley, 1906). Claiborne described the grass as "... the coarse, rank species peculiar to pine woods in these latitudes, grows dense and luxuriant, and, as we have stated, enables the people to subsist on the immense herds of cattle."

On July 16, 1841, Claiborne traveled easterly from Augusta to Leaksville and described the people and economy of the area ... "Many of the people are herdsmen, owning large droves of cattle, surplus increase of which are annually driven to Mobile" (Riley, 1906). The cattle were free ranging "... permitted to run in the range or forest, subsisting in summer on the luxuriant grass with which the teeming earth is clothed, and in winter on green rushes or reeds, a tender species of cane that grows in the brakes or thickets in every swamp, hollow, and ravine" (Riley, 1906). Greene County was acknowledged for having developed "a profitable traffic" in agricultural commodities with Mobile (Alabama) including cattle, cotton, corn, melons, butter, cheese, eggs, honey, and chickens (Riley, 1906).

Farther north, at Winchester, Claiborne described extensive orchards, widespread cattle grazing, and cereal production. He again paints a similar picture of the great pine forest and espoused its suitability for the production of sheep "... wild summer grass grows luxuriantly all over the woods; the ravines abound with reeds, rushes and switch-cane, furnishing good and nutritious food throughout the winter, and the worn out and deserted fields supply the short pasturage upon which sheep thrive so well" (Riley, 1906).

Wild game was also an important saleable commodity for those living in the region. Claiborne wrote of the plentiful supply of deer and that "... many persons make it a business in the fall and winter to kill them for the Mobile market. Stalking or still hunting is the usual practice, and it is not uncommon for a good hunter to kill five or six in a day. When a sufficient number is thus collected they are thrown into a light horse wagon and driven down to Mobile, where they always command a ready sale" (Riley, 1906).

As for the forests, Claiborne's descriptions suggest vast, even aged stands of mature longleaf pine. In these forests of longleaf pine Claiborne saw the future economy of the region... "the great source of wealth in this country must ultimately be - for it is scarcely thought of - the lumber trade. The whole east is thickly planted with an almost unvaried forest of yellow pine [longleaf pine]. Finer, straighter, loftier trees the world does not produce. For twenty miles at a stretch in places you may ride through these ancient woods and see them as they have stood for countless years, untouched by the hand of man and only scratched by the lightning or the flying tempest. This growth of giant pines is unbroken on the route we pursued for a hundred miles or more, save where rivers or large water courses intervene, and then we find in the extensive swamps that bound them on each side a heavy growth of white oak, chestnut, and evergreens. The time must arrive when this vast forest will become a source of value. Rafts and lumber boats will sweep down the Pearl, Leaf, and Chichasawhay ... " (Riley, 1906).

Claiborne saw in the Pascagoula River Basin a great forest of longleaf pine that he believed to be more extensive than the pine forests of North Carolina (Riley, 1906). He believed that they would someday be used for the same purposes as those further east commenting ". . . yet we, with a pine forest more extensive, with a sea coast far less dangerous, with the means of subsistence cheaper and more abundant, and health much superior, *ship none of these great staple articles of commerce* (italics his), and our counties where these rich materials abound and where they might be manufactured to an almost unlimited extent, are all thinly settled. *The opinion that East Mississippi is poor and barren, and therefore destitute of resources, is erroneous*" (Riley, 1906).

The future of the region bore out Claiborne's predictions, the transition from cattle to timber slowly followed. While timber would ultimately become the primary forest product, an economy developed around naval stores and charcoal as well. In the earliest times of timber marketing, saw logs were generally floated to mills and cut into lumber. Medium sized trees were boxed and chipped and used for turpentine (naval stores) and smaller timber was burned into charcoal and marketed as a fuel (Cain, 1953).

Pines were the first important commercial tree species in south Mississippi. Yellow pine [longleaf pine] was used for lumber and pitch pine for turpentine, rosin, and tar (Cain, 1953). He further indicates that yellow pine was probably the first to be heavily utilized for lumber and gives several reasons for this. Yellow pine produced excellent lumber, was very abundant, and maybe the most important factor, it floated while the logs were still green. Yellow pine was only selectively cut at first due to the fact that the best trees were located on the uplands, often very far from mills and the streams that fed them. To reach the streams the logs were transported by caralogs, large two wheeled carts with seven to nine foot wheels. Logs were slung underneath the carts and pulled along by teams of oxen. Cain citing Weston (1953) notes that axe men engaged in this "selective logging" could cut 20-25 logs per day (28 inch diameter by 54 feet long). The difficulty in getting logs to market probably accounts for many of the uplands being cut after those areas which were more accessible to streams and the railroads that would be built later. Cain (1953) points out that rafting logs in the Pascagoula Basin was a common practice and mentions this activity in both Red and Black Creek. Logs were delivered to mills at Moss Point and Pascagoula.

Turpentine farming and charcoal production was also common in the Pascagoula region. Longleaf pine and slash pine were recognized as dual-purpose trees, for live trees could be chipped for their gum for several years before being harvested as timber. The pitch collected from pines was used for what was commonly known as naval stores. Naval stores included pine tar and pitch for caulking the hulls of ships and for tarring ropes (Cain, 1953). Other products included turpentine and rosin, both strategic military commodities. Charcoal production in the Pascagoula region relied upon demand from nearby urban markets including New Orleans and Mobile. Charcoal was used when a hot fire was required (ironing, cooking, heating) and little ventilation was available. (Charcoal burns without smoke and produces little odor (Cain, 1953).

Exploitation of the southern pines did not occur in earnest until the close of the Civil War. Much of the lumber produced in the Southern Pine Belt in the post war period was consumed locally. Following the introduction of standard gage railroads and trunk systems into the South the markets north of the Ohio River opened. By 1880, the favored white pine around the Great Lakes was nearly cut out and southern pine became more commercially attractive (Horn, 1943). The southern timber industry was well developed by 1890 and yellow pine was used widely. Longleaf pine was regarded as the preferred structural softwood and commanded a higher price than shortleaf pines (all other pines that were not longleaf).

In 1909, an examination of the forest resources of Mississippi was made following the request of Governor Noel. The result was a report prepared by Dunston (1913), *Preliminary Report of the Forest Conditions of Mississippi*, which divided the state into eight forest regions (corresponding with the chief geological subdivisions of Mississippi) and assessed the forest

conditions in each area. Dunston (1913) described the longleaf pine region as the most extensive and commercially important forest region in the State. The longleaf pine region included all or part of 29 southern Mississippi counties.

According to Dunston (1913), the longleaf pine region was "uniform in soil and vegetation, but is somewhat varied in topography." Dunston subdivided the region and described three important forest types: piney woods type; mixed pine and hardwoods type; and bottom-land types. The piney woods type occupied "fully 75 percent of the longleaf pine region . . . in this type longleaf pine grows in practically pure stands ... occupying the ridges and low tablelands but never the swampy areas" (Dunston, 1913). Dunston (1913) describes the longleaf pine forests of 1909 in much the same manner as Claiborne did in 1841. "The mature forest of longleaf pine is park-like in appearance. The trees are tall and cylindrical and free from branches to an average height of 40 to 50 feet. There is practically no reproduction and the forest floor is usually bare of shrubby growth. Grass, however, covers the surface, often forming a close sod."

The mixed pine and hardwood type was common only to the southwestern counties (Amite, Franklin, Copiah, Wilkinson). The bottom-land forest type was common to the inland river and creek bottoms and contained tree species that were adapted to the wet soils. Species included cypress, sycamore, ash, and tupelo gum. Higher areas (hummocks and second bottoms) favored a much wider variety of species such as loblolly pine, sweet gum, magnolia, beech, and oaks.

At the time of the survey, 1909, Dunston noted that northern Greene County still contained "unbroken forest cover over many townships" while the southern part of the county was "in truck farms". He also reported that in Green, Perry, Jones, and Wayne Counties several investment companies owned more than 200,000 acres of virgin longleaf pine.

Another survey of the vegetation of southern Mississippi was carried out by Lowe (1913). This survey subdivided Mississippi into nine distinct regions, also based on geological structure. The longleaf pine region is similar to that of Dunston but the western portion of the region extends further north. Lowe (1913) distinguished between two floral facies (divisions) in the longleaf pine region, one of the low, wet coastal areas and another of the upland pine region. Lowe reported that the upland forests of the region were almost pure stands of longleaf pine with a sparse mix of other species. For most of the region these stands were greater than 90 percent longleaf pine. Extensive species lists were developed by Lowe for upland forest areas, riparian areas, and alluvial flats.

2.4.6.5 Fire Ecology of Coastal Plains Pine Forests

The consistent descriptions of the virgin longleaf pine forests of Mississippi point to the importance of fire in the developmental history (succession) of these southern forests. Christensen (1981) suggests that fires have been influencing southeastern ecosystems since the Quaternary. This conclusion is based, in part, on pollen and charcoal analysis from sediments and indicate that most of today's dominant vegetation species and the ecosystems they

represent were present during and following the Wisconsin glacial period (roughly 10,000 years ago). Charcoal data also indicate localized variation in fire frequency (Christensen, 1981).

Christensen (1981), having reviewed the journals of early expeditions throughout the southeast prior to 1800, observed that one unifying theme was the high fire frequency in the region and that these fires were predominantly a management activity of Native Americans. These journals (Bartram, Catesby, Lawson), like Clairborne, depicted an open longleaf pine forest with a sparse understory and considerable herbage including prairie species (Christensen, 1981). Christensen (1981) estimates that fire frequency across the Coastal Plain savannas ranged between 2 to 8 years and that the incidence of natural fires from lightning strikes is low when compared to mountainous areas. This "savanna-like aspect" was presumably maintained by managed fires and is further supported by evidence of the presence of a large herbivore (woodland bison) as far south as southern South Carolina that would have required this type of range.

Other indicators of the presence of fire in these ecosystems is based on the life history of dominant species (longleaf pine), rates of fuel accumulation, and available moisture. Frequent surface fires would have maintained the savannah-like aspect of southern longleaf pine forests by preventing the invasion of shrubs. The exclusion of fires for long periods results in the elimination of prairie grass and a succession to hardwoods.

Later, Spanish settlers were also known to burn pine forests over winter to maintain a supply of forage (native grasses) for cattle (Wahlenberg, 1946). Wahlenberg (1946) states that "... the practice of winter burning to improve the forage is one of long standing, nearly all grazing on the unfenced open rangeland [longleaf pine forests] in the past having been accompanied by fires to remove accumulations of dead grass." This practice would also serve to preserve the savanna-like longleaf pine forests by eliminating hardwoods and scrub with fire and grazing.

Today, controlled burning is a forestry management tool used for site preparation, tree regeneration, fuel reduction, and timber management throughout the Southeast. Burning is also applied by wildlife agencies as a habitat enhancement and management tool. Research indicates that burning creates or maintains habitat type's that are selectively utilized by some species. For example, Exum et al., (1987) found that in general, eastern wild turkeys most often used pine stands older than 14 years, but hens with poults under 9 weeks old tend to rely on pines less than 10 years old and avoid areas not burned for more than 2 years. Exum et al., (1987) recommend that longleaf pine be burned in January and February after three growing seasons to maximize utilization by turkeys. They also indicate that burning can enhance fruit production in dogwoods and that thinning should improve turkey habitat if hardwoods are protected. The resulting habitat mosaic supports a variety of species and forest commodities. The understory of grasses and shrubs are maintained on the National Forest through frequent burning, either wildfire or prescribed fire. Prescribed burning on a three to five year cycle maintains the vegetation in an open condition with a low shrub component. Prescribed fires are intentional burns made under specific conditions to produce fires of low intensity removing the top needle/leaf layer, killing small brush, and leaving the humus layer intact.

The forest cover types within the Camp Shelby permit area are typical of the Black Creek District with pine and pine/hardwood making up about 80 percent of the area. The shortage of hardwood and hardwood/pine stands has resulted in little or no regeneration cutting taking place in these stands, most of which are 40-60 years old. The age of the pine timber varies from newly cut stands to a few stands approaching 80 years old. About 9 percent is newly cut or planted, 19 percent from 4 to 23 years old, 25 percent from 24 to 53, and 47 percent from 54 to 73. The stands less than 25 years old average about 35 acres.

2.4.6.6 Origin and History of the Leaf River Wildlife Management Area

In 1932, the legislature of Mississippi created a wildlife department for the purpose of protecting and managing wildlife throughout the state. The newly created Mississippi Game and Fish Commission conducted a wildlife survey in 1933 and found that only a few hundred deer could be found in Mississippi. This finding prompted the development of a system of refuges where deer and other game species could be reared and later moved for release into other areas in Mississippi. Between 1933 and 1935 twenty game, bird, animal, and/or fur-bearing sanctuaries or refuges were approved by the Mississippi legislature. Many of these were state owned and had been subsistence properties (abandoned farms) although some were privately owned.

The foundation for wildlife restoration efforts in Mississippi was firmly established when two projects were approved by the state legislature in the late 1930s. Both were made possible with funds from the newly passed Pitman-Robertson Act of 1937. The first was Camp Kickapoo near Jackson and the second was known as the Wildlife Development Project of Mississippi National Forests in the De Soto National Forest. The latter would eventually become the cornerstone of Mississippi's wildlife restoration program.

According to state records, the second wildlife restoration project was being undertaken on thirty-thousand acres of the De Soto National Forest located in the corner of Perry County. The project became known as the Leaf River Development area. The area was leased by the Mississippi Game and Fish Commission from the U.S. Forest Service for the purpose of wildlife development and propagation. Reports show that by 1939, most of the Leaf River Development Project had been fenced, food plots had been planted, and fire breaks established throughout the refuge. Much of the construction work and road building was done by Civilian Conservation Corps (CCC) workers and USFS personnel.

Deer, turkey, and quail were the primary species to be propagated on the Leaf River refuge. The Game and Fish Commission established an 80 acre turkey corral and a 15,000 acre deer enclosure. Breeding stock was released into the fenced areas and predators were removed when necessary to protect the game. Seventy-two Mexican deer were released into the deer pasture in 1939. Fires were minimized and hunting was prohibited.

Before the introduction of breeding stock, only one deer was known on the refuge, and there were no turkeys, and few quail. The success of the Leaf River Refuge began to show by 1945. At that time records indicate that the refuge supported approximately 100 turkeys and 400 deer. The latter had responded dramatically since the original introduction increasing over five fold in just six years. Food plantings were being made annually to concentrate and

hold game on the protected area to increase the carrying capacity of the refuge. In addition, other habitat manipulation practices such as controlled burning were being used on the refuge to encourage habitat diversity.

The Leaf River Refuge had become the principal source of deer and wild turkey for restocking other refuges throughout the state. Between 1945 and 1947, fifty-four deer were captured from the Leaf River Refuge and transplanted to other areas. This number accounted for 65 percent of all deer used for restocking in Mississippi. The restocking program continued through the 1950's and more areas in Mississippi were again supporting huntable populations of white-tailed deer. In 1966, deer were present in every Mississippi county and the recovery of the white-tailed deer was nearly complete by the early 1970's. The last deer trapped from the Leaf River Refuge occurred in 1975.

The Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP) now manages the LRWMA primarily as a public hunting area. The Department of Wildlife, Fisheries, and Parks maintains food plots and develops habitat projects with the assistance and approval of the U.S. Forest Service. Much of their activity is now devoted to game management, law enforcement, and assisting the public as it uses the LRWMA for the many recreational activities available therein. The LRWMA is no longer being used or managed as a refuge. Its designation as a refuge was officially changed in 1982 when the Leaf River Game Management Area was renamed the Leaf River Wildlife Management Area.

The Mississippi Department of Wildlife, Fisheries, and Parks has maintained the LRWMA on an average annual budget slightly over $38,000 from 1989 through 1991. The budget is broken down into two major expenditure areas, operations and maintenance. Maintenance expenses are devoted to buildings, roads, fences, signs and boundaries, and public facility upkeep. Operational expenses dominate the budget. These include the costs associated with program administration, managed public hunts, and wildlife field projects. Figure 2-7 shows the expenses incurred by MDWFP for operational and maintenance cost at LRWMA for 1989, 1990, and 1991. Figure 2-8 shows the portion of the operational budget that goes toward direct wildlife management programs and projects. These include seeding, shrub planting, control of feral dogs and livestock, feeding and watering, managed public hunts, cooperation with research and providing technical assistance to the USFS vegetation management program which includes prescribed burning, various timber management practices, and wildlife stand improvement.

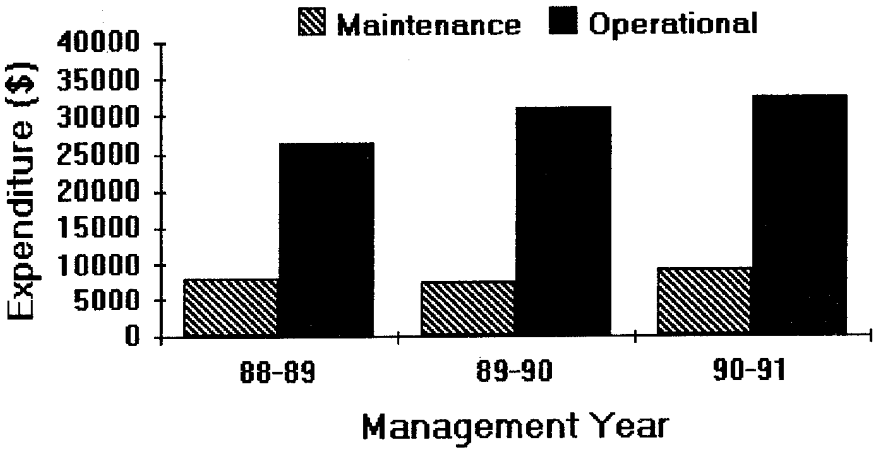

Figure 2-7 Expenses incurred by Mississippi Department of Wildlife, Fisheries, and Parks for operations and maintenance of the LRWMA, 1988 - 1991.

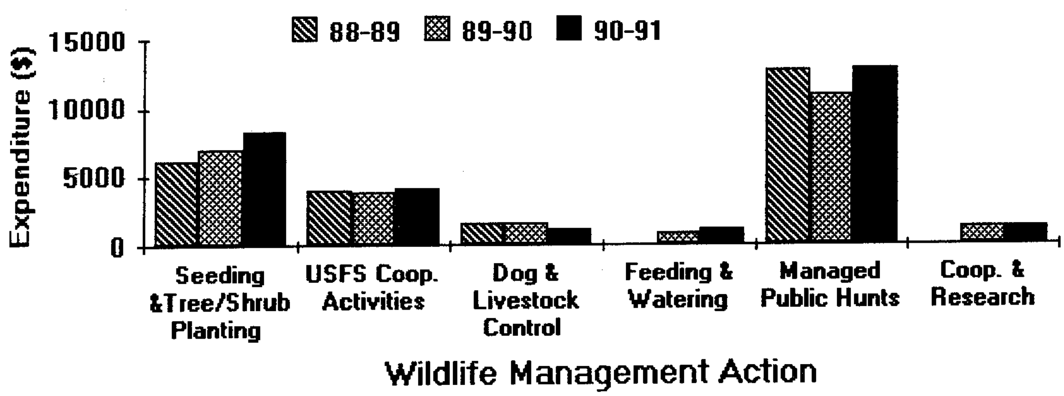

Figure 2-8 Portion of the Mississippi Department of Wildlife, Fisheries, and Parks operational budget that goes toward direct wildlife management programs and projects in the LRWMA, 1988 - 1991.

2.4.7 Biodiversity

As is pointed out in Section 2.4.3, longleaf pine constitutes approximately 63 percent of the coniferous forest types occurring on Camp Shelby at present. It is acknowledged by the U.S. Forest Service and the National Guard Bureau that virtually all mature longleaf pine in the (now) De Soto National Forest (DNF) area were harvested between 1820 and 1920. Thus, it follows that the average longleaf pine tree of today is younger and smaller than in pre-settlement times. Establishment of settlements and the subsequent development and accelerated growth of the commercial timber industry explains this transformation. Although longleaf pine is still the keystone plant species in the longleaf pine ecosystem, identifying and delineating its pre-settlement and presently occurring communities is difficult. In addition to the diverse aquatic communities, some of the more easily identified terrestrial communities include pitcher plant bogs, bottomland hardwood, dry upland, grassland, and riparian communities. Many scientists consider "edge" a distinct community as well. Some of these communities on Camp Shelby and the DNF have relatively few species when compared to other edge communities, but are nonetheless extremely important to biodiversity because: 1) each one has unique structural, genetic, and functional attributes; 2) there is acknowledged to be a high degree of interconnectedness among all communities; 3) many contain rare or declining species.

All human activities described in this chapter alter as well as influence biodiversity either directly or indirectly. While humans are considered a part of the ecosystems they occupy, society has not accepted all human-induced changes as "natural" events. For example, threatened and endangered animal species are protected under state and federal law, even though one might argue that the loss of an animal species is one possible "natural" outcome of a predator-prey or competitive relationship. The intent of this section is neither to debate the ecological role of humans nor to provide numerous species checklists, but to integrate the components and demonstrate how they contribute to biodiversity. In order to avoid redundancy, some of the highlights within certain sections are summarized. For the most part, readers are advised to refer to a specific sub-section for a more in depth discussion of the topic, or to consult the many tables in Appendix Q for the various plant and animal species identified in this study as being present within the Camp Shelby area.

A quantitative comparison of the species composition of today versus pre-settlement times would be desirable. These analyses would be highly beneficial in determining how representative Camp Shelby is of its pre-settlement condition. Unfortunately, large contiguous blocks of longleaf pine representing the pre-settlement pristine condition is not known to exist in Mississippi (Ken Gordon, personal communication, 1993). There have been relatively few published accounts which describe the flora and fauna of the longleaf pine region prior to the 1800's. J.F.H. Claiborne has written one of the more accurate accounts during his travels in 1841 through southern Mississippi (Riley, 1906). Observations by Lowe (1913), several decades later, provided additional insight into the conditions existing around the turn of the century. Claiborne observed that the area "...is covered exclusively with the longleaf pine: not broken, but rolling like the waves in the middle of a great ocean" (Riley, 1906). Similarly, Lowe (1913) said of the longleaf pine hills region"...long-leaf pine constitutes fully 90 percent of the [upland] tree growth..." Both Claiborne and Lowe reported that hardwood

trees were fairly common, but were largely restricted to low areas with poor drainage, and immediately adjacent to streams, rivers, and bogs. A similar situation exists today.

Unfortunately, Claiborne and Lowe emphasized trees and other woody species in their writings and included comparatively little information regarding the herbaceous understory. Great changes in plant classification and taxonomy also make comparing past and present flora difficult. Riley (1906) did mention that the fairly dense and "luxuriant" growths of grasses observed by Claiborne (1841) were common within the open canopy, which, prior to the great expansion of the timber industry, enabled many people to maintain large herds of cattle. Three of the grasses they may have observed are broomsedge bluestem (*Andropogon virginicus*), big bluestem (*Andropogon gerardii*), and pinehills bluestem (*Andropogon scoparium divergens*). Broomsedge bluestem is still a dominant species in many open stands of longleaf pine exceeding 30 years on Camp Shelby. Broomsedge bluestem is consumed by cattle and grows fairly well on nutrient deficient soils but does not tolerate shade particularly well. Ecologically, broomsedge bluestem may be considered an "invasion" species, moving into sunny areas of bare soil. Based on Land Condition-Trend Analysis (LCTA) data collected to date, the dominant grass found in grasslands and stands of longleaf pine up to 30 years in age is pinehills bluestem. Considered a much more desirable species because of its fire resistance and somewhat greater nutritional value, pinehills bluestem is not very tolerant of grazing and is likely much reduced today from pre-settlement times. Similarly, big bluestem is an excellent cattle forage, and is also found on prairies and stands of open pine, but does not appear to be as abundant as it might have been because it also does not tolerate overgrazing.

As southern Mississippi became more populated, more timber was cut not only for export but also cleared for building homes, seeded for pasture, or cultivated for crops. Since 1940, as longleaf pine was harvested, many of the sites were replanted with slash or loblolly pine, considered to provide a quicker return on the investment. Thus, economics played a significant role not only in fragmenting the pre-settlement forest, but also changing the species composition, thereby dramatically altering local and regional biodiversity.

Unlike the historical accounts provided by Riley (1906) and Lowe (1913), today's Land Condition-Trend Analysis data is being used to characterize the present vegetation and wildlife in a more quantitative fashion. Identified forest stand types (loosely considered communities) on Camp Shelby and the DNF include longleaf pine, slash pine, slash pine-hardwood, bottomland hardwood-yellow pine, hardwood-pine, loblolly pine, loblolly pine-hardwood, pine-hardwood, scrub oak, undrained flatwoods, sweet gum-nuttall oak-willow oak, sweetbay-maple, sweetbay-swamp tupelo-red oak, and white oak-black oak- yellow pine. The yellow pine stand type is a U.S. Forest Service term referring to the mixture of the different pine types occurring on Camp Shelby (J. White, personal communication, 1993). The various stand types reflect the variety of soil conditions and topography found on Camp Shelby. Thus, human-induced changes in soil or slope could alter the site conditions and favor the establishment of a different community. Many of the "communities" have species or groups of plant and animal species associated with one or more stand types and/or age-classes. Longleaf and slash pine excluded, many of the less common community types do not have managed stands representing every possible age-class, at least on Camp Shelby. The degree to which these community types are representative of pre-settlement condition is not known,

and therefore no attempt was made in Chapter 3 (present and proposed impacts) to quantitatively compare the "before" and "after."

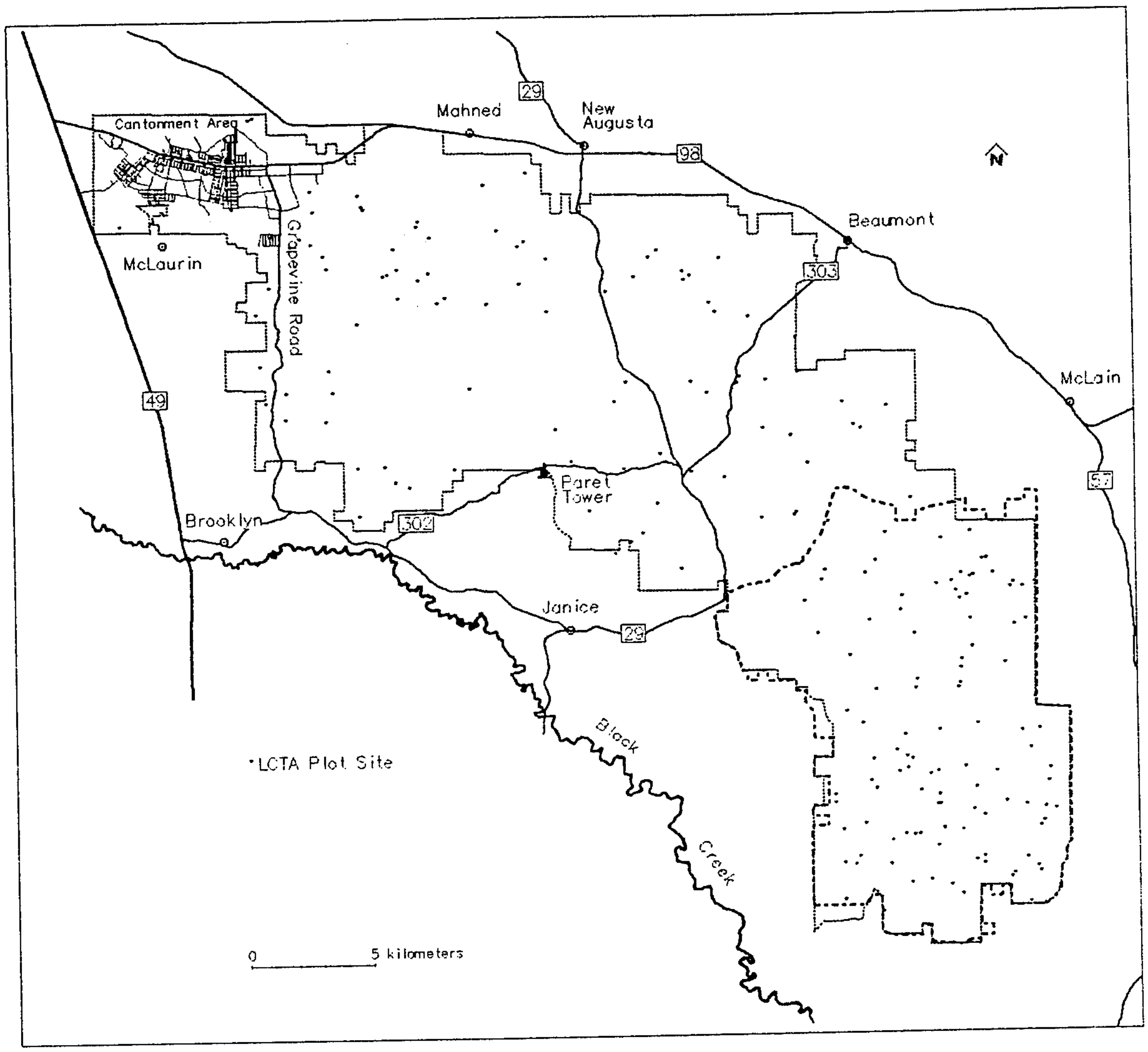

Figure 2-9 Location of LCTA Study Plots Established 1990-1991 on Camp Shelby

As part of the Army's Land Condition Trend-Analysis Program (LCTA), a floristic inventory of Camp Shelby was conducted from 1990 to 1993. From the surveys, 78 families, 192 genera, and 368 species were documented (Appendix Q). Thirty three (11 percent) of those species (approximately 50 percent are forbs) were classified as being introduced (exotic or non-native) annuals, vines, shrubs, etc. While not particularly abundant relative to native species, little research has been conducted on the introduced species to assess their impact(s) on the indigenous plant communities.

The diversity of Camp Shelby is evident in the overstory tree species and also in the midstory and understory plant associations. There is a noticeable upward trend in species composition and structure as one moves from dry uplands to bottomlands, and also from the 0-10 year age class to the 50-70 year-old stands. In the majority of longleaf pine dominated stands, flowering dogwood, post oak, and southern red (spanish) oak comprise much of the mid-story. Yaupon, sparkleberry, and inkberry dominate much of the understory. Grasses are also a major component of the percent understory, with pinehill bluestem and *Panicum* species (e.g., switchgrass) being the most common. On well drained floodplains and moist terraces, hardwoods become prevalent in the overstory. In the most poorly drained areas, hardwoods are clearly dominant, with a decrease in grasses and an increase in forb species.

The 213 LCTA study plots were established over a two-year period (1990-1991) and are distributed throughout the Camp Shelby permit area (Figure 2-9). These plots represent the various timber stand types and age classes as delineated by the U.S. Forest Service. Overall, approximately 53 percent of the forested area on Camp Shelby is longleaf pine, and 109 (51%) of the LCTA plots are located within its delineated age-classes. The eight age classes are 0-10 Year Old, 20 Year Old, 30 Year Old, 40 Year Old, 50 Year Old, 60 Year Old, 70 Year Old, and 80 Year Old. Again, as a result of cutting of the timber in the early 1900s, no stands of longleaf pine older than 100 years exists on Camp Shelby. The forest composition on Camp Shelby seems to closely reflect the overstory forest composition as reported for the Black Creek Ranger District as a whole.

Looking at the life form (e.g., grass, shrub, or tree) and life span (annual/perennial) gives a different perspective on the biodiversity of Camp Shelby. Block and others (1991) report that of the 335 native plant species documented in the 1991 LCTA survey, 12.2 percent were annuals, and 87.8 percent were perennials. Quantifying the plants in terms of life form, 48.7 percent were forbs, 16.4 percent trees, 14.6 percent grasses, 8.7 percent shrubs, 7.1 percent grass-like (rush/sedge), and the remaining 4.5 percent were vines. The degree to which these percentages compare to pre-settlement conditions is unknown. Trees or shrubs are the most visible life forms to many people, but the data indicate forbs (non-woody, non-grass, but herbaceous) also contribute significantly towards biological diversity.

The vertical structure and complexity in terrestrial communities is lowest in grasslands and in recent clear cuts, and as a general rule, the complexity and variability of the vertical structure increases as woody species take root and mature. Land Condition-Trend Analysis (LCTA) data collected in 1991 from the permanent plots confirm this. Foliar Height Diversity (FHD) indices calculated for the various age classes of longleaf pine indicate grassland habitats with a FHD value of 1.29 and FHD of 1.72 for stands of 70-100 year old pine, with the maximum value possible being 1.94 (Appendix Q). Plant Species Diversity (PSD) indices were also

calculated for the various age classes and stand types. The 50-70 year-old longleaf pine had a PSD value of 4.35 with a species richness of 172, and the 30-50 year-old longleaf pine had a PSD value of 3.98 with a richness value of 130 (Appendix Q). These values clearly indicate that the longleaf pine is more diverse in terms of species present, especially within the 50-70 year-old age class.

Neotropical migrants comprise approximately 60 percent of the bird species observed on the LCTA plots during the nesting season (Appendix Q). Many of these species are particularly sensitive to man-induced habitat perturbations, and it is therefore probable that the abundance of neotropical migrants today is considerably less than existed when the area was settled. The black bear, Florida panther, bobcat, and red wolf are some of the mammalian species which were more abundant prior to European immigrants settling in the area and the development of an organized timber industry. The combination of accelerated forest fragmentation, human habitation, and unregulated hunting contributed greatly to their decline.

As reported in Section 2.3.5.2, all wetland-related habitats combined, cover a significant portion (approximately 20,000 acres or 14 percent) of the Camp Shelby permit area. Many of the wetland communities have unique and significant assemblages associated with them (e.g., Pitcher Plant Communities and the associated Camp Shelby burrowing crayfish). Some of the wetland categories include seasonally flooded, semi-permanently flooded, permanently flooded, and saturated. Some wetland species exhibit a strong association to a specific wetland type. For example, vegetation in permanently flooded sites is dominated by species dependent on standing water. The ability of each soil type to retain water and the slope of an area are the two major factors determining which sites can support hydrophytic (water adapted) vegetation. Thus, the variability in soils and topography on Camp Shelby directly influences biodiversity.

The various stand types and age-class combinations represent compositional and structural diversity for the terrestrial plant communities. Land Condition-Trend Analysis data supports the fact that the structural variability exhibited within the various age-classes of longleaf pine contributes to a more diverse wildlife community (Appendix Q). Because the role or importance of each species within a community is also far less understood, *functional* diversity within and between stand types and age-classes is also far less understood. As an example, Solbrig (1991) cites the American chestnut (*Castanea dentata*) as an example in which a dominant native species was eliminated from the eastern deciduous forest (between 1920 and 1950) due to an imported disease, with no apparent effect on its associated biological community. It is appropriate to emphasize the "no apparent" portion of the statement, as little long-term data are available to support the observation. Lastly, there is a profound lack of genetic data on the great majority of plant and animal species inhabiting the region, and it is "not feasible" within the scope of this document to quantify or characterize the communities from a genetic standpoint (e.g., in terms of gene flow or gene frequencies). It is, however, appropriate to recognize the extreme importance of genetics in biodiversity, even though much of the discussion in this Final EIS focuses on structural and compositional components.

In summary, the wide variety of plant and wildlife species listed in the various sections of Chapter 2 (Sections 2.4.4 and 2.4.5) and Appendix Q is due to the great diversity, combinations and interactions of plant species, successional stages, topography, habitat structure, land use, and other variables associated with the physical and biological environments on Camp Shelby and surrounding National Forest lands. Unfortunately, there is not a suitable "control" site in which to determine how representative Camp Shelby is of the pre-settlement condition. Promoting genetic variability is a critical factor in conserving populations and thus biodiversity. Habitat fragmentation, habitat degradation, and reduction or loss of "keystone" species are three of the identified factors which clearly reduce biological diversity.

2.5 Social Environment

The Camp Shelby region (Figure 1-2) exhibits extremely varied patterns of population and social structure. Several counties are distinctly rural, with only one town over 10,000, and large numbers of scattered rural residents. Other counties, notably Forrest, contain one or more cities in the 40,000 to 50,000 population class (Table 2-5). The contrast between urban and rural origins, housing, education, income, employment and recreational pastimes is distinct across the region. Harrison County, bordering the Gulf, is considered to be outside the Camp Shelby economic region, but contains much larger metropolitan areas, and its population contributes significantly to recreational demand in the area. Many of the issues raised by the public in the scoping process (Section 1.1.7, and Appendix P) are reflective of this diversity of background and outlook.

2.5.1 Land Ownership

The Camp Shelby area exhibits a complicated pattern of land ownership (Figure 2-10). The U.S. Forest Service administers National Forest lands, which form a mosaic with interspersed private, state and Department of Defense-owned lands. Closely associated parcels may be held by any of these parties. In the composition of Camp Shelby, the nucleus of land in the Cantonment (northwest) Area consists of State of Mississippi land. To the east of that zone, many patches of Department of Defense owned land are found. Interspersed with this variety of public ownership are many parcels of privately-held land. Only Sections 16 are owned by local school districts. Many parcels of private land, including some Sections 16, are leased by the National Guard for use as a part of Camp Shelby. The number of parcels leased at any one time is somewhat variable, thus the acreage under Camp Shelby management also varies from year to year.

2.5.2 Employment Profile

The Economic Impact Forecast System (EIFS) developed by the U.S. Army Construction Engineering Research Laboratory (Robinson et al., 1984) was used to assess the 1989 County Business Patterns of the five county Camp Shelby region (Figure 2-11). The five counties used were Forrest, Greene, Lamar, Perry, and Stone. The 1980 and 1990 population statistics for the five county region are provided in Table 2-5. The selected 1989 County Business Patterns for employment, income, and establishment by industry are provided in Table 2-6 below (Refer also to Appendix M, Section C). The County Business Patterns data records

show that out of the 91 total establishments in SIC 2400 category (Lumber and Wood Products), in the selected five-county region, 68 were logging camps and contractors. These 68 employed 467 employees and the average annual income for each employee was $15,546. There were 9 sawmills & planing mills having a total of 437 employees, and 1 pulp mill employing 403 people. The pulp mill was the single largest employer in the region while the remaining businesses were composed of several small industries. This category (SIC category 2600) of industry was selected because it was noted to be of particular concern to the public during public scoping activities (Appendix P).

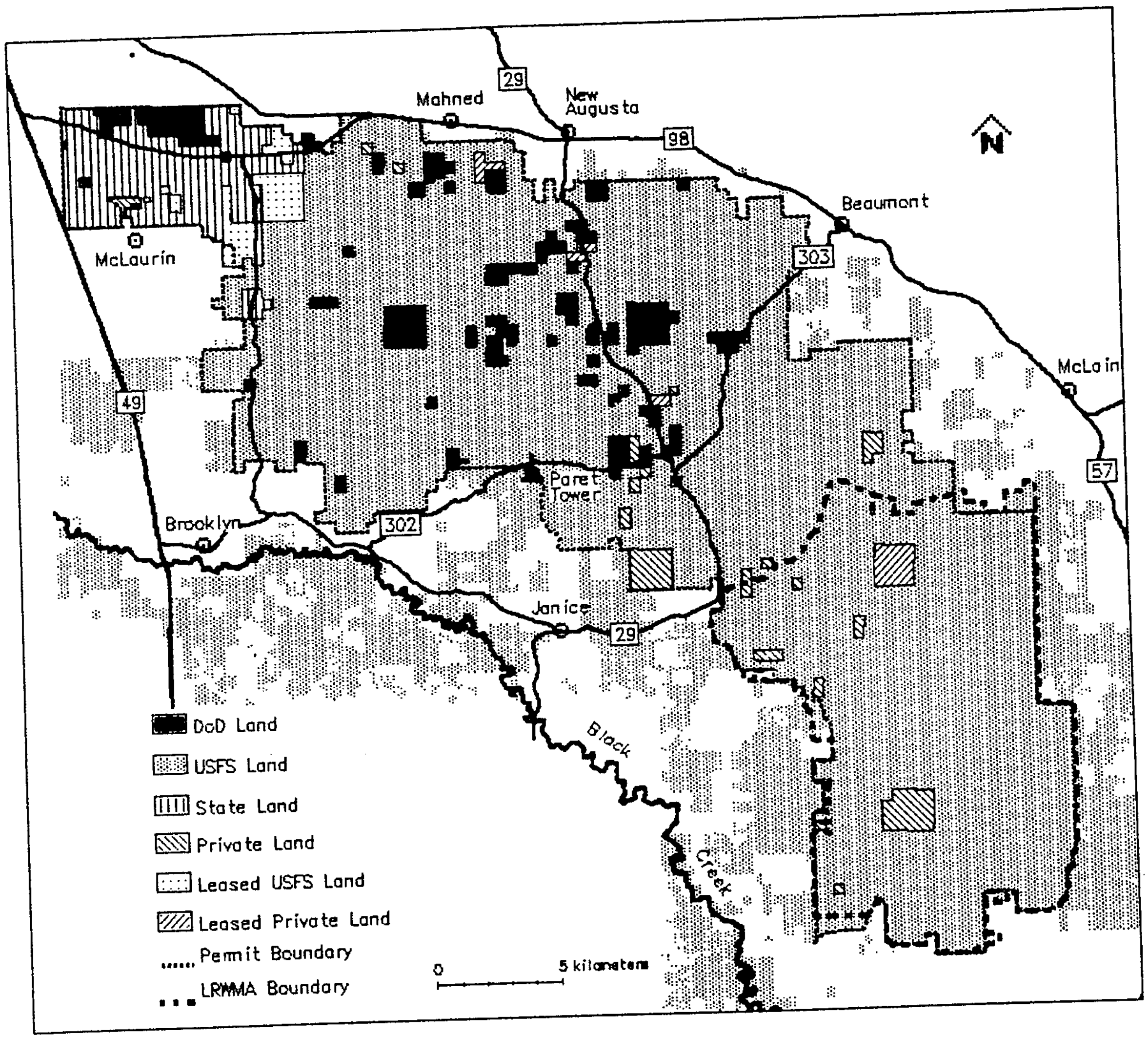

Figure 2-10 Camp Shelby Area Land Ownership

Table 2-5

1980-1990 POPULATION OF MISSISSIPPI COUNTIES AND CITIES

COUNTY/CITY	1980	1990	Whole No. Change	%Change
FORREST	66,018	68,314	2,296	3.5
Hattiesburg	39,687	41,882	2,195	5.5
Petal	8,476	7,883	-593	-7.9
GREENE	9,827	10,220	393	4.0
Leakesville	1,120	1,129	9	0.8
McClain	688	536	-152	-22.1
State Line	282	395	113	40.1
LAMAR	23,821	30,824	7,003	29.1
Lumberton	2,210	2,121	-89	-4.0
Purvis	2,256	2,140	-116	-5.1
Sumrall	1,197	903	-294	-24.6
PERRY	9,864	10,865	1,001	10.1
Beaumont	1,112	1,054	-58	-5.2
New Augusta	589	668	79	13.4
Richton	1,205	1,034	-171	-14.2
STONE	9,716	10,750	1,034	10.6
Wiggins	3,205	3,185	-20	-0.6

Source: U.S. Census Bureau, 1990 and the South Mississippi Planning and Development District.

Table 2-6

SELECTED 1989 COUNTY BUSINESS PATTERNS FOR EMPLOYMENT, INCOME, AND ESTABLISHMENT BY INDUSTRY

SIC	Employment	Key	Income*	Estab.	Industry
2400	1,442		24,685	91	Lumber & Wood Prods
2410	467	D	7,260	68	Logging Camps & Contractors
2420	437	D	7,196	9	Sawmills & Planing Mills
2430	392	D	7,581	3	Millwork, Plywd. & Strct.
2440	30	D	373	2	Wood Containers
2490	107	D	1,895	6	Misc Wood Products
24r0	9		154	3	(residual)
2600	1,444	D	44,403	5	Paper & Allied Products
2610	403	E	16,135	1	Pulp Mills
2620	72	B	2,765	1	Paper Mills, except Bld. Paper
2650	50	B	1,221	1	Paperboard Containers & Boxes
91--	13,164		230,881		Government
9100	1,733		30,999		Federal Gov (BEA)
9110	876		24,661		Federal Civilian (BEA)
9120	857		6,338		Federal Military
9200	11,431		199,882		State, Local Gov (BEA)

* Income: Dollar values are in thousands.
Key: Non-disclosure keys for number of employees (min-max):
B: 20-99 C: 100-249 E: 250-499 F: 500-999
D: Aggregated non-disclosures

2.5.3 Archeological and Historical Resources

2.5.3.1 Prehistorical and Historical Background

The following text on the prehistoric and historic background for the Camp Shelby area is taken from the description prepared by DeLeon (1983: 5-7) for his survey of a proposed new tank maneuver area at Camp Shelby.

> "Prehistoric sites in the general vicinity of the maneuver area indicate that man has been present for around 9,000 years. The general pattern of prehistoric occupancy infers extensive rather than intensive usage through time. The natural environment lent itself to food resource procurement as a kind of huge hunting and gathering preserve, instead of an area conducive for long term habitation. Indian groups were able to move freely through the area in pursuit of desired resources according to seasonal availability. The landscape also lent itself to a relatively unrestricted settlement pattern, in that the logistical requirements for occupational areas could be met at countless numbers of areas throughout. Undoubtedly, sites found in the area correspond to hunting or seasonal camp sites of short duration. Large village or base camps are unknown for the area, attesting to the transient nature of the prehistoric occupation (DeLeon 1981a, 1981b).
>
> "The area was part of the Indian cession in the Treaty of Mt. Dexter of 1805 in which 5 million acres of Piney Woods in south Mississippi were ceded to the United States by the Choctaws. Public land surveys were conducted in 1810 and a land office was subsequently established at Augusta for handling the sale of the surveyed lands. Settlers entered the newly opened lands from older settlements in Georgia and the Carolinas via the Three Chopped Way, or the Natchez to Fort Stephans Road, and by the old Federal Road between Mobile and New Orleans. By this time the old Natchez District to the west of the area had attracted numerous settlers desiring to farm the fertile lands there. The sandy soils of the Piney Woods did not support profitable agriculture, however the extensive open pine forest with its blanket of coarse grasses and cane brakes supported extensive cattle raising.
>
> "The lifestyle of the early settlers was tied to cattle which roamed freely throughout the forest, though herded and driven annually to markets in Mobile or New Orleans. Hogs, sheep and turkeys were also raised extensively. The population density in the area during the early years was extremely sparse. Accounts indicate that distances over 10 miles between homesteads were not uncommon, and the lack of markets or commercial centers dictated a great measure of self-sufficiency on the part of the dispersed family units. Towards the middle of the 1800s the pastoral economy was in rapid decline because the open range that sustained it was being destroyed by over-grazing and uncontrolled fires. Two other situations arose which contributed to the alteration of the herding lifestyle. The final cessions of Chickasaw and Choctaw tribal lands in the 1830s opened up millions of acres of good agricultural land north of the Piney Woods. Seemingly overnight backwoods settlements and homesteads were abandoned in pursuit of better lands. Also, a lumber industry was slowly developing in various locales in the Piney Woods which offered a small measure of

employment to those pastoralists who remained while others opted for ceded tribal lands.

"The lumber industry began slowly in the area prior to the Civil War, and was oriented to procuring naval stores, spars and structural members. Steam sawmills were established at the mouth of streams emptying into Mississippi Sound, and their need for saw timber stimulated the development of a significant logging enterprise in the interior. Logs adjacent to the streams were felled initially and rafted downstream to the mills. Later, logs were brought to the streams with 'caralogs', or large cart-wheels pulled normally by four yokes of oxen. Rafting declined towards the close of the 19th century, and gave way to an increasingly exploitative industry dependent on the railroads.

"The railroads served mainly northern markets which in turn fostered the development of a vast network of tramways and spurs extending into virtually every locality in the Piney Woods. Almost instantly sawmills sprang up and lined the trunk lines, each serving as the nucleus for a small community. This was a time of prosperity; people were collecting cash wages, but it was short lived. By 1925, the mills had consumed the virgin timber, leaving a desolate land covered with stumps, scrubby growth, and unchecked fires.

"Following the decline of the mill towns, the barren land reverted back to the herder. Herdsmen practiced the time-worn tradition of open range and yearly burning, however the free-roaming stock and fires were not compatible with a landscape struggling to rejuvenate a denuded forest. A measure of order emerged when the new wave of forest conservation of the early 1900s filtered down when in 1933 the National Forest Reservation Commission approved the purchase of the Leaf River Unit. The Leaf River Unit, together with the adjacent Biloxi and Chickasawhay units began to be administered as the De Soto National Forest in 1936."

Camp Shelby was first established in 1917 as a training center for the 38th Division, which was made up largely of soldiers from Indiana and Kentucky. This group of National Guardsmen named the post in honor of Colonel Isaac Shelby, a Revolutionary War hero and the first governor of Kentucky. At its height during the First World War approximately 36,000 troops were stationed at Camp Shelby. Following the end of the war, Camp Shelby was demobilized and closed.

With the breakout of hostilities in Europe in 1939, the War Department determined that Camp Shelby should again be opened for training troops. By September 1940, funds had been allocated and new construction at the camp had begun. The first unit to be trained at the camp was again the 38th Division of the National Guard. Following the entry of the U.S. into the war, the 37th, 43rd, 65th, 68th, and 85th Divisions received the bulk of their training at Camp Shelby. Elements of the 31st Division trained here, and the 28th and 95th Divisions were brought to the camp from Germany for additional training prior to their transfer to the Pacific Theater (the signing of peace with Japan canceled the need for this transfer). Additional smaller units also received training at Camp Shelby during the Second World War; foremost of these was the 442nd Regimental Combat Team. The 442nd was made up of

American volunteers of Japanese descent. By the end of the war, the 442nd was one of the most decorated U.S. combat units. German prisoners of war were also detained at the camp after being transferred to this country from the North African and European battle fronts. At its height Camp Shelby housed over 105,000 troops.

Following the end of World War II Camp Shelby was again demobilized. With the exception of some facilities owned by the state of Mississippi, all federal property at the camp was disposed of by the War Assets Administration. The camp remained dormant until the Korean War, when it was designated an Emergency Railhead Facility and was developed as a stand-by facility. During the summer of 1954 non-divisional National Guard units from Third and Fourth U.S. Army areas trained at Camp Shelby. The camp has been the site of annual field training encampments since that date. In 1956, Camp Shelby was designated a permanent National Guard Field Training Site by the Continental Army Command and Third U.S. Army. Troops were initially housed in tents, but efforts were made to secure permanent barracks. In August 1958, Congress appropriated $580,000 for construction of the first permanent concrete block barracks. The overall Camp Shelby plan was approved by the Department of the Army in February 1959. This plan has since been adopted as the model plan for future construction at all Field Training Sites in the United States.

2.5.3.2 Historic Preservation Plan

In October 1985, representatives of the Army National Guard, the U.S. Army Corps of Engineers, the Mississippi State Historic Preservation Officer (SHPO), and the U.S. Forest Service met at Camp Shelby as part of the initiation of a Historic Preservation Plan (HPP) for Camp Shelby. Subsequently, the Corps, in consultation with the Mississippi SHPO and the U.S. Forest Service, delineated lands within Camp Shelby that appeared to have a high potential for the location of archeological sites. The selection of these locales, designated High Potential (HP) areas, was based upon prior archeological surveys and investigations in and around Camp Shelby, primarily DeLeon (1981a, 1981b, and 1983) and Padgett and Heisler (1979), as well as the collective professional experience of the archaeologists from the Corps, the Mississippi SHPO and the U.S. Forest Service.

The primary basis for the identification of the HP locales is high ground adjacent to water, which in this area are ridges adjacent to small creeks and intermittent drainages. Such locational criteria for archeological sites has been proven effective. DeLeon (1983) further notes a prehistoric preference in this area for sites to be located at ridge locations at the headwaters of a branch or drain.

After acceptance by the U.S. Forest Service and the Mississippi SHPO of the HP locales, the areas were categorized by levels of disturbance based upon past and present military land use. The historical background information presented above further documents extensive land alteration by timbering activities dating back to the mid to late 1800s. The basic tenet was that the more an area had been disturbed, the less potential that area possessed for the presence of intact archeological resources. With military land use as a basic means of segregating the locales, three categories of disturbance were identified:

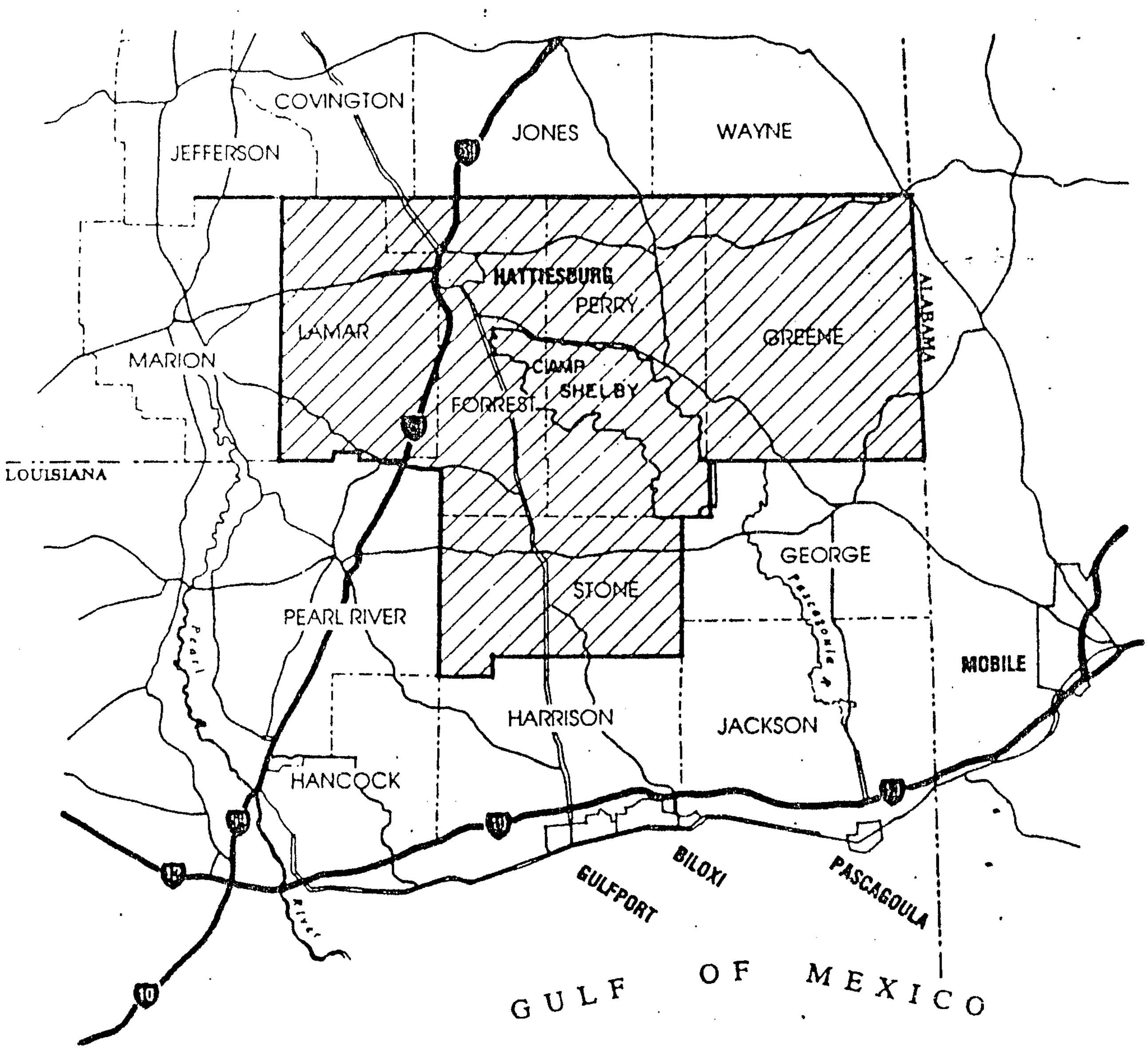

Figure 2-11 Camp Shelby Economic Region

- High Disturbance: This is defined as impact areas, firing ranges, air strips, ammunition storage areas, bombing ranges, and all Cantonment Areas, including the now abandoned WWII cantonment.

- Moderate Disturbance: This is defined as lands which have been heavily impacted by tracked vehicle maneuvers and other motorized traffic. All areas presently or in the past used as tank maneuver areas have been designated as moderate disturbance areas.

- Low Disturbance: This is defined as lands subjected to less severe impact from military activities, especially those lands in the southern portion of the installation. All training areas which have not been used in tank training have been designated as low disturbance areas.

Areas thought to have a high potential for archeological resources were thus identified in moderate and low disturbance areas. Areas of high disturbance were not recommended for any archeological survey. A 10 percent sample of HP locales in moderate disturbance lands was recommended for survey, and a 20 percent sample of HP locales in low disturbance lands was recommended for survey. Depending on the findings of these surveys, the Historical Preservation Plan (HPP) proposed additional consultation with the Mississippi SHPO regarding further survey efforts for these lands.

The draft HPP for Camp Shelby was submitted to the Mississippi SHPO, the U.S. Forest Service and the Advisory Council on Historic Preservation in November 1986. Comments were received from the Mississippi SHPO and the U.S. Forest Service that same month. No comments were received from the Advisory Council on Historic Preservation and in March 1988, the Army National Guard informed the Council that the plan would be implemented as proposed and approved by the Mississippi SHPO and the U.S. Forest Service unless they commented. No comments have been received from the Advisory Council.

Table 2-7 presents a summary of archeological survey efforts to date at Camp Shelby by the Corps. Although the HPP proposed sampling of HP locales to provide information on areal coverage surveyed, the sampling is expressed in acres and locale count. This does not include the 6,500 acres of lands surveyed by other parties at Camp Shelby. These additional acreages increase the acreages surveyed to 10,856 acres which represents 8.2 percent of the camp's total of about 134,000 acres or 10.3 percent of the 105,000 acres which are considered surveyable. Unsurveyable lands are considered to be those within the Cantonment Area, or within the current and World War II impact areas and their buffer zones. Approximately 40 sites have been identified by these combined survey efforts; none however were determined eligible for the National Register.

As shown in the table, 9,932 acres were identified in low disturbance lands at Camp Shelby as having a high potential for archeological resources. The Corps surveyed 3,968 acres or 39.9 percent of the HPs in low disturbance areas. The HPP had proposed a 20 percent sample. The percentage of survey by locale count was 34 percent.

Within the moderately disturbed lands at Camp Shelby 983 acres were identified as having a high potential for archeological resources. Three hundred and eighty-eight acres, or a 39.5

percent sample of those lands, were surveyed by the Corps. This represents a total of four high potential locales or a 40 percent sample of the total ten HP locales in moderately disturbed lands at Camp Shelby. The HPP proposed a 10 percent sample of HP locales in moderately disturbed lands.

In November 1988, a report summarizing archeological survey work at Camp Shelby by the Corps was submitted to the Mississippi SHPO. The report concluded that sufficient archeological surveys had been completed to support the prediction that no National Register of Historic Places are present at Camp Shelby. The National Register eligibility of two Camp Shelby structures, the White House, Building 1071, and the World War I ammunition storage building, Building 6981, was reaffirmed. On December 2, 1988, the Mississippi SHPO concurred with that report and with the recommendation that no additional archeological surveys were warranted for Camp Shelby. Building 6981 was placed on the National Register in 1992.

Table 2-7

Army National Guard Camp Shelby, MS Corps of Engineers Archeological Survey Summary Table

Potential Area	Disturbance Level	Total Acres	Total HP Acres	Surveyed HP Acres	% Surveyed Total Acres	% Surveyed HP Acres	HPP Sample %	# of HP Number of areas HP Areas	# of HP Number of areas Surveyed	% Surveyed HP Areas
HIGH (HP)	Low	67,774	9,932	3,968	5.8%	39.9%	20%	106	36	34%
	Moderate	37,429	983	388	1.0%	39.5%	10%	10	4	40%
SUMMARY		105,203	10,915	4,356	4.1%	39.9%		116	40	34.5%

Additional Corps archeological surveys were conducted at Camp Shelby to test the effectiveness of survey techniques utilized by the Corps and the U.S. Forest Service in previous surveys. It had been suggested that close interval subsurface shovel testing and screening of materials would be more effective in locating archeological sites at Camp Shelby. Prior to the additional survey work, a meeting was held at Camp Shelby on April 2, 1990, with U.S. Forest Service and Mississippi SHPO archaeologists to agree upon techniques to be used and areas to be examined. Areas were subjected to both previously used survey techniques of pedestrian survey and judgmental subsurface testing if deemed necessary, as well as close interval bucket auger or shovel test transects. Materials were screened through 1/4 inch mesh hardware cloth. In no instance was a site located by the transect testing which was not also identified by pedestrian survey. In one instance a site located by pedestrian survey was not represented in any shovel test excavated in the site area.

In July 1990, a summer employee with the U.S. Forest Service conducted an assessment at Camp Shelby. As stated in his report:

> The assessment was to be made based on field research as well as a literature review. It was to contain an opinion as to the validity of the cultural resources investigations carried out by the Mobile Corps of Engineers and recommendations by the investigator as to what further actions might need to be taken by the U.S. Forest Service to ensure the protection of its cultural resources (Giliberti, 1990).

The Giliberti assessment questioned the validity of all prior surveys, models and techniques used at Camp Shelby by both the Corps and the U.S. Forest Service and recommended further surveys. The assessment located 12 archeological sites, none of which were recommended as eligible for the National Register. The sites were found by various means including simple pedestrian survey, a technique considered inappropriate for survey elsewhere in the report, and shovel testing and screening. Giliberti in fact states "...none of these sites directly conflict with the Corps' opinion of the area's cultural resources..." (1990: 4).

In September 1990 a meeting was held at Camp Shelby among representatives of the Army National Guard, the Corps, the Mississippi SHPO and the U.S. Forest Service. It was the opinion of the Mississippi SHPO and the Corps at that meeting that no additional archeological surveys were necessary at Camp Shelby. The U.S. Forest Service, however, expressed the opinion that additional archeological surveys were necessary.

During the Special Use Permit (SUP) negotiations in December 1990, the Army National Guard and the U.S. Forest Service agreed to conduct additional archeological exam work prior to ground disturbing activities on National Forest lands. This archeological survey requirement was made a part of the proposed Special Use Permit at Clause 47.

On June 12, 1991, a final meeting was held at Camp Shelby with the representatives of the Army National Guard, the Corps, the Mississippi SHPO and the U.S. Forest Service to conclude discussions of historic resource considerations. At that meeting the U.S. Forest Service agreed that concerns for historic resource management and protection on Special Use Permit lands were addressed when the Mississippi Army National Guard agreed, as part of the December 1990 Special Use Permit negotiations, to conduct archeological exams for proposed actions on National Forest lands when so required by the U.S. Forest Service. The Mississippi SHPO and the Corps were of the continuing opinion that no further archeological surveys were warranted at Camp Shelby.

2.5.4 Recreation Availability

Outdoor recreation is important in the lifestyle of a very large number of the residents of the Camp Shelby area, as is typical of the region as a whole. During the Public Involvement process (see Section 1.1.7) questions were raised about the degree to which military training activities at camp Shelby had the potential to interfere with outdoor recreation. Following this expression of concern, a special study of the outdoor recreation opportunities and experiences of persons in Southeast Mississippi was undertaken. This study (Appendix F)

used mail and telephone queries to obtain information on the types of recreation sought by visitors and residents in the area.

In the results of this survey (Appendix F), there were a total of 3,559 responses provided by 917 persons (n=917), for an average of four recreation activities per person. Hunting made up 20 percent of the 3,559 responses and was the most popular outdoor recreation activity, with 80 percent (Appendix F, Table 4) of the respondents indicating they hunt. Of the other frequently selected activities, 59 percent of respondents listed camping, 55 percent fishing, 55 percent driving for pleasure, 43 percent hiking, and 35 percent canoeing.

When respondents were asked to select the one activity they participated in most, 69 percent chose hunting. The second most popular selection was canoeing with 8 percent, followed by 7 percent for camping (Appendix F, Table 5). All persons responding were users of Camp Shelby or immediately adjacent areas (Appendix F, Figure 1). These results are in general agreement with the State Comprehensive Outdoor Recreation Plan results, which show fishing and hunting as the most popular activities in the general region (as reported in Appendix F). Further, the statewide data indicate that participants in these activities spend all or part of more than 30 days per year in these pastimes, a very high level of participation.

Camp Shelby lands, at times when they are not closed for military purposes, provide significant hunting opportunities, and somewhat lesser fishing and camping capabilities. The closure schedule is specifically planned so that a few or no closures for military purposes occur during periods of especially high hunting pressure, such as the deer and turkey seasons.

2.6 Economic Environment

2.6.1 Regional Economy

2.6.1.1 Present Status

The Rational Threshold Value (RTV) profile was aggregated for the five county region, (Appendix M, Section B). The RTV profile analyzes historical trends in business volume, personal income, employment, and population to measure the extent of their fluctuations in the past, for the purpose of allowing an estimate of the level of impact which a proposed action may cause.

Business volume is an indication of a region's local aggregate economic activity. It represents the total dollar flow of the four major sectors of a local economy: the wholesale, retail, manufacturing, and services sectors. Personal income includes wages and salaries for work performed as an employee during a specified time. Employment could be measured in two ways, 1) number of employees, or 2) total employment in man-years. Total employment takes both full and part-time employees into consideration. The values for these four variables reported for the most recent year (1988) are presented in Table 2-8 below (all dollar amounts are in thousands of dollars).

Table 2-8

1988 RTV PROFILE

Business Volume

Year	Non-Farm income	Personal income	Employment (number)	Population (number)
1988	913,623	1,356,204	56,894	124,800
Pos RTV	6.845%	5.145%	3.200%	1.987%
Neg RTV	-5.981%	-3.647%	-3.029%	-0.715%

The 1990 and 1991 Labor Force Profiles as reported by the Bureau of Labor Statistics are provided in Tables 2-9 and 2-10 below.

Table 2-9

1990 LABOR FORCE PROFILE

Date	Civilian Labor Labor (Number)	Employment Number	Employment Rate	Unemployment Number	Unemployment Rate
Jan 1990	61,295	57,716	94.16 %	3,579	5.84 %
Feb 1990	61,122	57,469	94.02 %	3,653	5.98 %
Mar 1990	61,403	57,681	93.94 %	3,722	6.06 %
Apr 1990	61,556	58,056	94.31 %	3,500	5.69 %
May 1990	61,735	58,216	94.30 %	3,519	5.70 %
Jun 1990	62,796	57,995	92.35 %	4,801	7.65 %
Jul 1990	63,521	59,040	92.95 %	4,481	7.05 %
Aug 1990	62,524	58,139	92.99 %	4,385	7.01 %
Sep 1990	62,180	58,368	93.87 %	3,812	6.13 %
Oct 1990	61,698	58,299	94.49 %	3,399	5.51 %
Nov 1990	62,496	58,723	93.96 %	3,773	6.04 %
Dec 1990	62,944	58,975	93.69 %	3,969	6.31 %
Annual Average	62,367	58,485	93.78 %	3,882	6.22%

Source: Bureau of Labor Statistics, 1990.

2.6.1.2 Trends

OBERS projections for historical years (1969, 1973, 1978, and 1983) as reported by the Bureau of Economic Analysis are provided in Table 2-10. It is indicated in Table 2-11 that the employment by the category of "Ag. Serv., For., Fish.", which includes forest industry, increased from 1969 to 1973, then decreased in 1978, but increased again by 1983. The Non-Durable Goods category, which includes lumber and wood products that peaked in 1978, continued to show a decrease in the number of jobs from 1969 to 1983. Employment in the Total Government category continued to increase from 1969 to 1978, but showed a decline by 1983. The general trends in most of these industries either showed an overall decline or remained static during the years from 1969 to 1983.

Table 2-10

TOTAL PERSONAL INCOME, PER CAPITA INCOME, AND EARNINGS BY INDUSTRY

Year	1969	1973	1978	1983
INDUSTRY				
Total Pers. Income	250,446	337,861	428,539	480,740
Population (number)	98,400	106,700	115,900	123,300
Per Capita Income	2,544	3,166	3,697	3,898
Per Capita Relative	60	66	70	71
Total Earnings	193,258	251,331	312,216	321,018
Farm	7,751	14,210	12,112	6,923
Agricultural Svcs., Forestry, Fish.	928m	1,584m	778m	1,784
Mining	2,572m	3,258m	3,843	4,426m
Construction	15,876	15,503m	20,007m	37,201m
Total Manufacturing	44,266	54,474	69,054	56,322
Non-Durable Goods	31,285	29,837m	36,547m	33,222m
Durable Goods	12,981	11,529m	25,985m	17,151m
Total Government	37,799	55,116	65,135	64,655
Federal, Civilian	6,543	7,843	8,619	8,092
Federal, Military	1,322	1,844	1,949	2,269
State and Local	29,934	45,429	54,567	54,294

Key:

m Aggregation for this variable includes some missing information.

Earnings and Total Personal Income are in thousands of 1972 dollars.

Per Capita Personal Income is in 1972 dollars.
Per Capita Relative: US = 100.

Table 2-11

EMPLOYMENT BY INDUSTRY (TOTAL NUMBER OF JOBS)

YEAR	1969	1973	1978	1983
INDUSTRY				
Total Employment	36,051	43,023	48,709	48,204
Farm	3,077	3,499	2,970	2,634
Agricultural Svcs., Forestries, Fisheries	218m	291m	180m	371
Mining	290m	347m	378	349m
Total Manufacturing	7,267	8,321	9,097	7,090
Non-Durable Goods	5,099	4,305m	4,838m	4,009m
Total Government	7,867	10,175	11,574	10,839
Federal, Civilian	696	739	799	769
Federal, Military	990	965	880	791
State and Local	6,181	8,471	9,895	9,279

Key:

m Aggregation for this variable includes some missing information.

2.6.2 Mineral Extraction

Potential for oil and gas occurrence is associated with salt domes (See Section 2.3.3.2). As of March, 1992, there were 32 active mineral leases for exploration and extraction of resources found on National Forest lands within the Camp Shelby permit area. These leases occupy 31,378 acres of National Forest land. Two of these leases, totalling 3,963 acres, are currently in active production for natural gas and oil. Actively producing wells and active reinjection wells are shown in Figure 2-12. The potential of additional reserves is considered to be low (Weatherford McDade, 1991). A lease for 621 acres for exploration for sulfur exists, and wells were drilled in 1991, but no determination of economic viability has been made. In addition to those lands held by the U.S. Forest Service, and leased under authority of the Department of the Interior Bureau of Land Management, an additional 3,775 acres of U.S. Forest Service administered land have mineral rights which are privately held, in whole or in part. They are shown in Figure 2-12.

Florida Gas has a special use permit for a high pressure gas transmission line within the Camp Shelby special use permit area. Gravel and sand for use in construction and road maintenance have also been mined from the area. Although none is currently being mined, production is based on local needs, and may resume in the future (Weatherford McDade, 1991). The status of minerals on state and Department of Defense lands varies with deed conveyance.

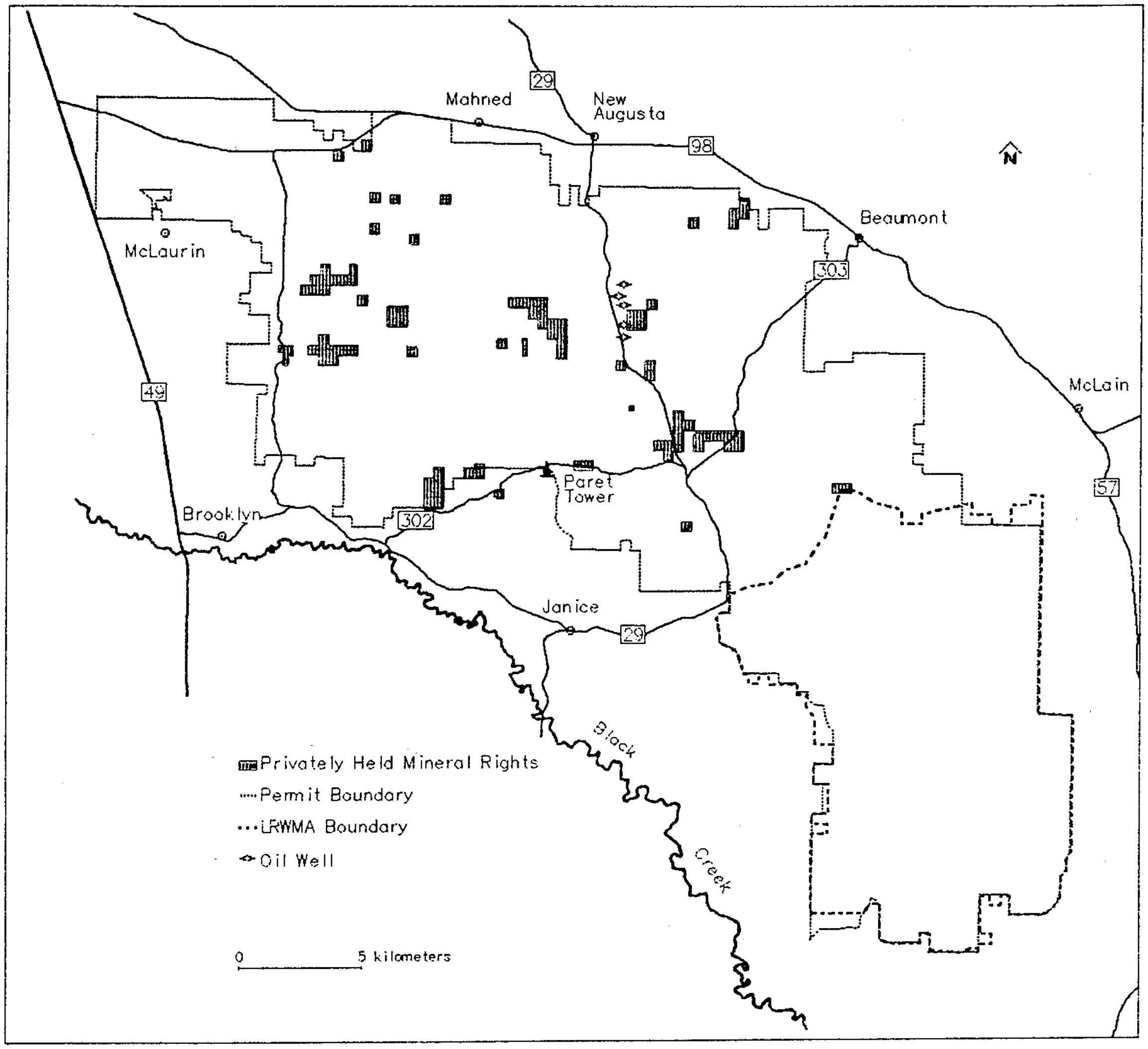

Figure 2-12 Oil Wells and Privately Held Mineral Rights Where USFS has Surface Rights at Camp Shelby

2.6.3 Forest Industry

The five county economic area comprised of Forrest, Greene, Lamar, Perry, and Stone Counties contained 27 active forest product manufacturing companies in 1985 (Directory of Mississippi's Forest Industries 1985, Mississippi Forestry Commission, July 1986). Total employment for these companies lay in a range from 1300 to 2700. Products produced were: Kraft pulp, softwood lumber, pine plywood, treated lumber-poles-piling, pallets, mulch, decorative timbers, trusses, custom cabinets, hardwood lumber, veneer, wood chips, brooms and mops.

These companies purchased about 60 percent of the 144 million board feet (MMBF) sold in the period 1986-1990 from the Black Creek Ranger District. Approximately one-half of this came from the Camp Shelby permit area. National Forest timber was the source of as much as 25 percent of some lumber companies raw material. Most of the smaller companies do not utilize National Forest timber.

In addition to manufacturing companies there are several wood yards that purchase pulpwood for transport via rail or truck to various mills in Mississippi, Louisiana, and Alabama. These yards typically employ 1-10 people. This does not include the large number of 1-3 person pulpwood crews that furnish a large percentage of the pulpwood to these wood yards. There is no reasonable estimate of these workers as they are not included in any industry surveys.

2.6.3.1 County Returns

By law, the Forest Service, in lieu of taxes, must return 25 percent of its receipts to the counties which contain National Forest land. These funds must be used for roads and schools. The relative dollar amount these counties receive is based on the proportion of National Forest acreage held within the county. Ten counties (Forrest, Stone, George, Greene, Harrison, Jackson, Jones, Perry, Wayne and Pearl River) share De Soto National Forest receipts. The total of payments to these counties in FY 1991 was $2,100,000. The counties of Forrest, Greene, Perry and Stone received, in total, more than $1,200,000 of this sum. Table 2-12 below shows the disbursements for fiscal years 1990 and 1991.

Table 2-12

PAYMENTS TO COUNTIES
DE SOTO NATIONAL FOREST

County	NF Acres	1992 Returns	1993 Returns	10 Year Average
FORREST	50,031	$213,859	$192,626	$207,547
GEORGE	8,781	$37,355	$32,241	$37,142
GREENE	33,191	$141,199	$122,174	$140,310
HARRISON	62,516	$265,950	$230,967	$261,166
JACKSON	18,795	$79,956	$69,206	$80,235
JONES	32,951	$140,178	$126,372	$139,935
PEARL RIVER	3,805	$16,187	$14,886	$16,642
PERRY	161,929	$688,866	$634,785	$689,180
STONE	41,909	$178,286	$154,974	$176,753
WAYNE	90,146	$383,492	$376,619	$385,376
TOTAL	504,054	$2,145,330	$1,955,380	$2,134,286
AVERAGE PER ACRE		$4.26/ac	$3.88/ac	$4.23/ac

Final
Environmental Impact Statement

Military Training Use of National Forest Lands: Camp Shelby, Mississippi

Chapter 3

ENVIRONMENTAL CONSEQUENCES

3.0 ENVIRONMENTAL CONSEQUENCES

Chapter 3 of this EIS examines six different levels of environmental consequences associated with the conduct of military training activities at Camp Shelby. Because several different, though interrelated, discussions are presented, the reader is asked to first keep in mind which set of environmental consequences is of interest. The different examinations are, in sequence, the potential effects of the present activities *prior to implementation of avoidance or mitigation actions* (Section 3.1), the effects of these existing, ongoing training activities after considering those avoidance and mitigation actions now being utilized (Section 3.2), effects of those activities newly proposed in this EIS *prior to implementation of new or improved avoidance or mitigation actions* (Section 3.3), effects of these newly proposed actions *following* implementation of planned mitigation and impact avoidance processes (Section 3.4), cumulative effects of all past, present and proposed military training activities on the Camp Shelby area (Section 3.5), and, last, a discussion of those irreversible and irretrievable commitments of resources which have resulted, or are predicted to result from the presence of military training at Camp Shelby (Section 3.6). For most readers, the comparisons of Sections 3.1 with 3.2, and of 3.3 with 3.4, will provide the most complete picture of the consequences of present and proposed effects, respectively. The preparers note that this arrangement is slightly different than that under which the Draft EIS was developed, and that point by point comparisons between the Draft and Final EIS must allow for this renumbering. Sections 3.2 and 3.3 in the DEIS have, effectively, been reversed, and the previous sections beginning 3.2 now begin with 3.3, and vice-versa. This was done in response to requests to complete the discussion of present effects and mitigations before examining proposed actions and effects.

3.1 Effect of Present Training Activities

3.1.1 Physical Environment

3.1.1.1 Climate

Current activities at Camp Shelby do not have a significant effect on the general climatic patterns or the individual climatological parameters at Camp Shelby. The precipitation patterns, mean temperatures and prevailing winds are typical of the regional climate and little influence from current activities on Camp Shelby would be expected (Figure 2-2 and Table 2-4).

3.1.1.2 Landforms

The general landform characteristic of Camp Shelby is not significantly affected by current uses. Landform features are commonly used to enhance training activities but the basic landform and geologic formations are not affected (Weatherford McDade Ltd., 1991).

3.1.1.3 Soils

In general, Camp Shelby soils are usually light in color, over six feet deep, and a variety of textures. These soils may lie in any soil class ranging from sandy loams to silty clays. Depending upon their soil type and structure, Camp Shelby soils may be classified into different drainage classes ranging from well-drained to poorly-drained soils. Soil organic matter content is variable both spatially at the surface as well as vertically. The acidic nature of these soils is often reflected in the low soil pH values which range from approximately 4.5 to 6.0 (U.S. Department of Agriculture Soil Conservation Service, 1979). The local topography varies from nearly level land features to steep slopes, and from gently sloping to rolling hills.

Soil erosion by water resulting from damage by vehicular traffic and other training activities is the most common impact of military training to the soil resources of Camp Shelby. Damage includes: soil disturbance, compaction, loss of vegetation cover, and sediment transport into surface waters and downstream wetlands. Although other natural factors such as soil characteristics and climate do contribute to erosion, excessive soil erosion is more frequently a direct result of tracked and wheeled vehicular traffic, explosive ordnance, and other training activities. Were there no repair and mitigation actions in place, the potential for sediment transport into surface waters and downstream wetlands would be high. Table 3-1 presents the relative potential for 20 typical military training activities to affect the environment in different ways.

In 1990 and 1991 U.S. Construction Engineering Research Laboratory (USACERL) and the Mississippi Army National Guard (MSARNG) implemented the Integrated Training Area Management (ITAM) program on Camp Shelby. The Land Condition-Trend Analysis (LCTA) thrust of the program is designed to inventory and monitor natural resources and land use. This is accomplished by allocating 200 permanent transects or plots for data collection in a stratified random design with 100 sample points per transect (Tazik et al, 1991). The impact area was excluded for safety reasons. Summaries of the 1991 and 1992 data indicate that 12 and 19 percent, respectively of these 200 plots showed some sign of military use, primarily wheeled and tracked vehicle use (Figure 3-1). 35 and 65 percent, respectively, of the plots showed some sign of non-military use, primarily forestry practices (Figure 3-2). Based on percentage of transect points, the data also indicate that 5-10 percent of the ground area was disturbed by some use like a road, trail, pass by a vehicle, or some other use like foot traffic or bivouac site (Figure 3-3). Some sign of soil erosion by water was evident on 67 percent of the transect points in 1991 but only on 22 percent in 1992 (Figure 3-4). This large difference is probably the result of several factors; however, in the past, budgetary and logistical problems have resulted in approximately 20 percent of the problem areas needing rehabilitation going untreated. However, due to increased commitment of resources from MSARNG in 1992, 100 percent of areas needing rehabilitation received it. Other problems like frequent fires caused by tracers and artillery

Table 3-1a
Potential for Present Military Activities to Affect the Environment
(Please interpret scores as: + = beneficial; o = no effect; - = detrimental)

ENVIRONMENTAL ASPECT	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t
SOILS (GENERAL)	-	-	-	-	o	-	-	-	-	- -	-	-	-	o	o	o	-	- -	o	o
SOIL EROSION LOSSES	o	o	o	o	o	o	o	o	o	-	o	o	o	o	o	o	o	-	o	o
WATER QUALITY	o	o	o	o	o	o	o	o	o	-	-	o	o	o	o	o	o	-	o	o
NOISE	o	-	o	-	-	o	o	o	-	-	-	-	o	o	o	o	- -	-	o	o
WETLANDS	o	o	o	o	-	o	o	o	o	-	-	o	o	o	o	o	o	-	o	o
WETLAND INTEGRITY	o	o	o	o	-	o	o	o	o	-	-	o	o	o	o	o	o	-	o	o
GROUNDCOVER	-	-	-	-	o	-	o	o	-	- -	- -	-	-	o	o	o	-	- -	o	o
T, E & S PLANT SPECIES*	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
TIMBER SUPPLY	o	o	o	-	-	o	o	o	-	-	-	-	o	o	o	o	-	-	o	o
WILDLIFE HABITAT	-	o	o	-	o	o	o	o	o	-	-	o	o	o	o	o	o	- -	o	o
SMALL GAME SPECIES	-	o	o	o	o	o	o	o	-	-	o	o	o	o	o	o	o	-	o	o
T, E & S ANIMAL SPECIES*	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
BIODIVERSITY	-	o	o	o	o	o	o	o	o	-	-	o	o	o	o	o	o	-	o	o
EMPLOYMENT	+	+	o	+	o	o	+	+	o	++	++	o	o	o	-	o	o	++	o	o
SELLERS OF TIMBER	o	o	o	o	o	o	o	o	o	-	-	o	o	o	o	o	o	-	o	o
REGIONAL ECONOMY	+	+	o	+	o	o	+	+	o	++	++	o	o	o	+	o	o	+	o	o
OUTDOOR RECREATION	o	o	o	o	o	o	o	o	-	-	-	o	o	o	o	o	o	-	o	o
CULTURAL RESOURCES	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
WILDERNESS/SCENIC RIVERS	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
WOOD PRODUCTS INDUSTRY	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o

The letter codes, a through t represent military uses, and are described in Section 2.1.1.2 and Table 2-1 (reproduced below as Table 3-1b)

rounds and prescribed annual fires result in the destruction of protective vegetative cover in the impact area and other ranges. This lack of vegetation, again, has the potential to cause sheet and

Table 3-1b Training Area Usage Codes

Usage Code	Typical Uses	Usage Code	Typical Uses
a.	Bivouac and Small Unit Tactics	k.	Engineer ARTEP Training
b.	Convoy Training	l.	Mortar Training
c.	Medical Training	m.	Engineer Brigade Training
d.	Aviation Training	n.	Land Navigation Training
e.	Airborne Training	o.	Primary Leadership Training
f.	Supply and Service Training	p.	Water Purification Training
g.	NBC Training	q.	Air Force Tactical Training
h.	Patrolling	r.	Tracked Vehicle Maneuver and ARTEP Training
i.	Artillery Training	s.	Special Operations
j.	Infantry ARTEP Training	t.	Vehicle Swim Operations

gully erosion. Besides training areas, the 13,000-acre impact area has exhibited some erosion problems which may lead to on-site soil erosion, surface water quality problems and wetland siltation.

Camp Shelby's soil conservation and land rehabilitation plan follows the guidelines described in Erosion Control Plan (1988) for Camp Shelby. This document was prepared by the Department of Wildlife and Fisheries, Mississippi State University and is referred to hereinafter simply as the Erosion Control Plan (1988).

Disturbed areas are revegetated, and conservation structures, such as terraces (Table 3-2), are used where and when appropriate. A major conclusion of the 1988 plan was "...despite generally successful agronomic and engineering practices to conserve soil resources, there still remain many problem areas needing remedial measures." The Erosion Control Plan has specific recommendations, including: (i) the establishment of vegetation to reduce soil loss and protect long-term soil productivity, (ii) control of runoff and sediment transport to protect riparian resources, (iii) repair of gullies and other landscape damage for safety and continued availability of land for training use, and (iv) control of sediment transport into surface waters to comply with stream water quality standards. Implementation of these recommendations

has been a major focus of the Camp Shelby environmental program since that time. A full description of erosion control planning and management practices is given in Section 3.2.2.

Impact of Training Activities On Wet Soils: Army training activities, especially the employment of wheeled/tracked vehicles during wet periods, pose the following impacts to Camp Shelby soils: (1) Destruction of vegetation and soil structure and the subsequent soil erosion, leading to sediment delivery to downstream wetlands and surface waters. (2) Soil compaction. This results in an increase in soil bulk density and a reduction in soil porosity caused by external forces.

Sediment Generation: The second impact from wheel- and track-type vehicular traffic on wet soils is loss of vegetation followed by reduced infiltration and drainage, and increased sediment delivery to surface waters and wetlands. The primary preventive measure is to avoid heavy vehicle traffic on soils that are near their plastic limit (see Section 3.5.2.2). Training can be continued on sandy areas, if available. This is because sandy soils are not as susceptible to compaction or soil puddling as are the loam and clay soils.

Table 3-2

Recommended Slope-distance relationships for construction of terraces.

SLOPE	MAXIMUM SPACING
<2%	450 Ft.
2-4%	300 Ft.
4-6%	200 Ft.
6-18%	150 Ft.
>18%	120 Ft.

Compaction: Some concern about soil compaction is reasonable because of the heavy loads of the wheel- and track-type vehicles that are used on training lands, especially when such activities take place when the soils are wet and can be easily compacted.

Compaction refers to the increase in soil density as a result of applied loads or pressure. Compaction increases progressively with the water content to a maximum and then decreases with further addition of water. This maximum occurs at approximately 80 percent of saturation and is known as the optimum water content for compaction. While traffic on soils with moisture above maximum compaction levels will not result in additional compaction, soil structure will be severely damaged and surface sealing will occur. Water infiltration will be limited until this seal is removed by tillage or by natural processes such as freeze/thaw or drying/wetting.

Soil compaction results from horizontal forces caused by thrust, as well as from vertical forces produced by loading (Gill and Reaves, 1956). Tracked vehicles produce vibrating stresses that make the total stress considerably higher than the average for the same ground pressure. Detrimental effects of vehicles are greater when the soil is at moisture content near field capacity. Peak compaction occurs at moisture content near the plastic limit, which is about the optimum condition for tillage operations. For a given soil, the increase in soil compaction due to vehicular traffic will be least when the soil is dry and greatest when the moisture content is near field capacity. Therefore, training activities should be scheduled, as and when possible, under dry soil moisture conditions (see Section 3.5.2.2).

The effect of soil compaction on plant development has been the objective of numerous studies. However, the effects of soil compaction from wheel- and track-type vehicles are not yet well understood. Trouse (1971) stated that a plant can respond normally as long as all of its nutrient needs are satisfied. According to Trouse, soil density (which is an indicator of compaction) is not a plant need. If adequate soil moisture supplies are available, there is little difference in plant growth due to compaction.

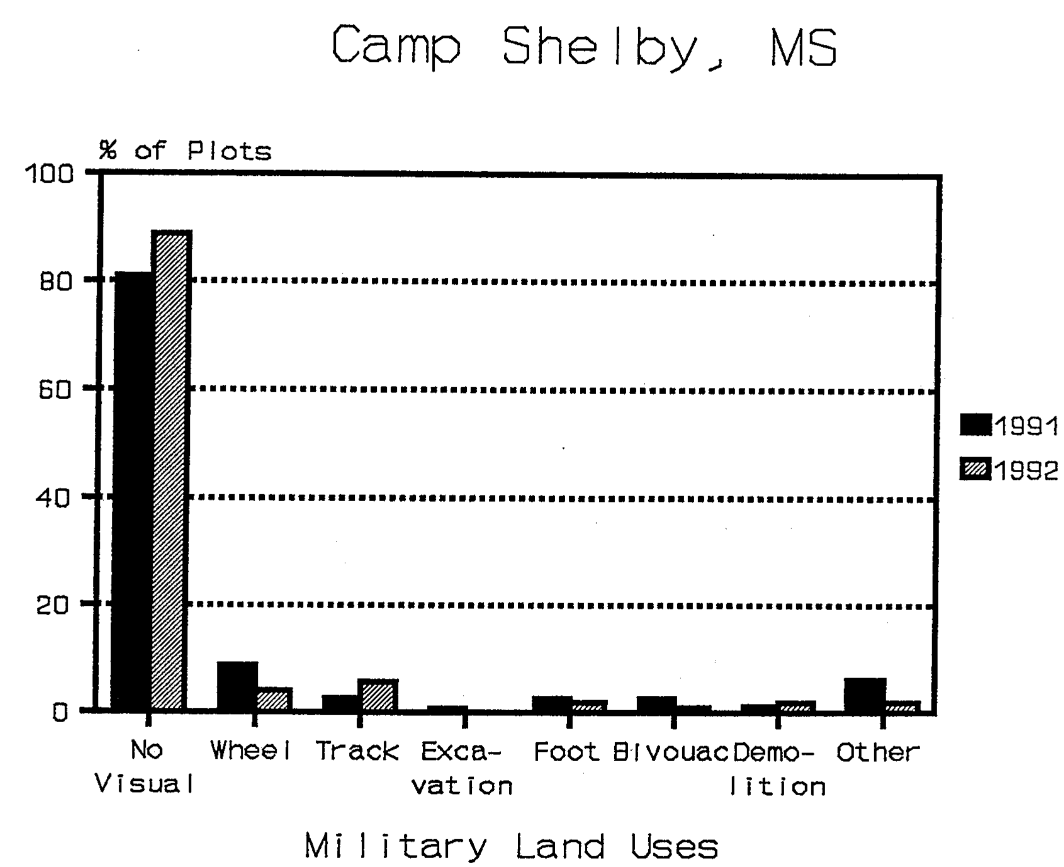

Figure 3-1 Military Land Uses 1991-1992

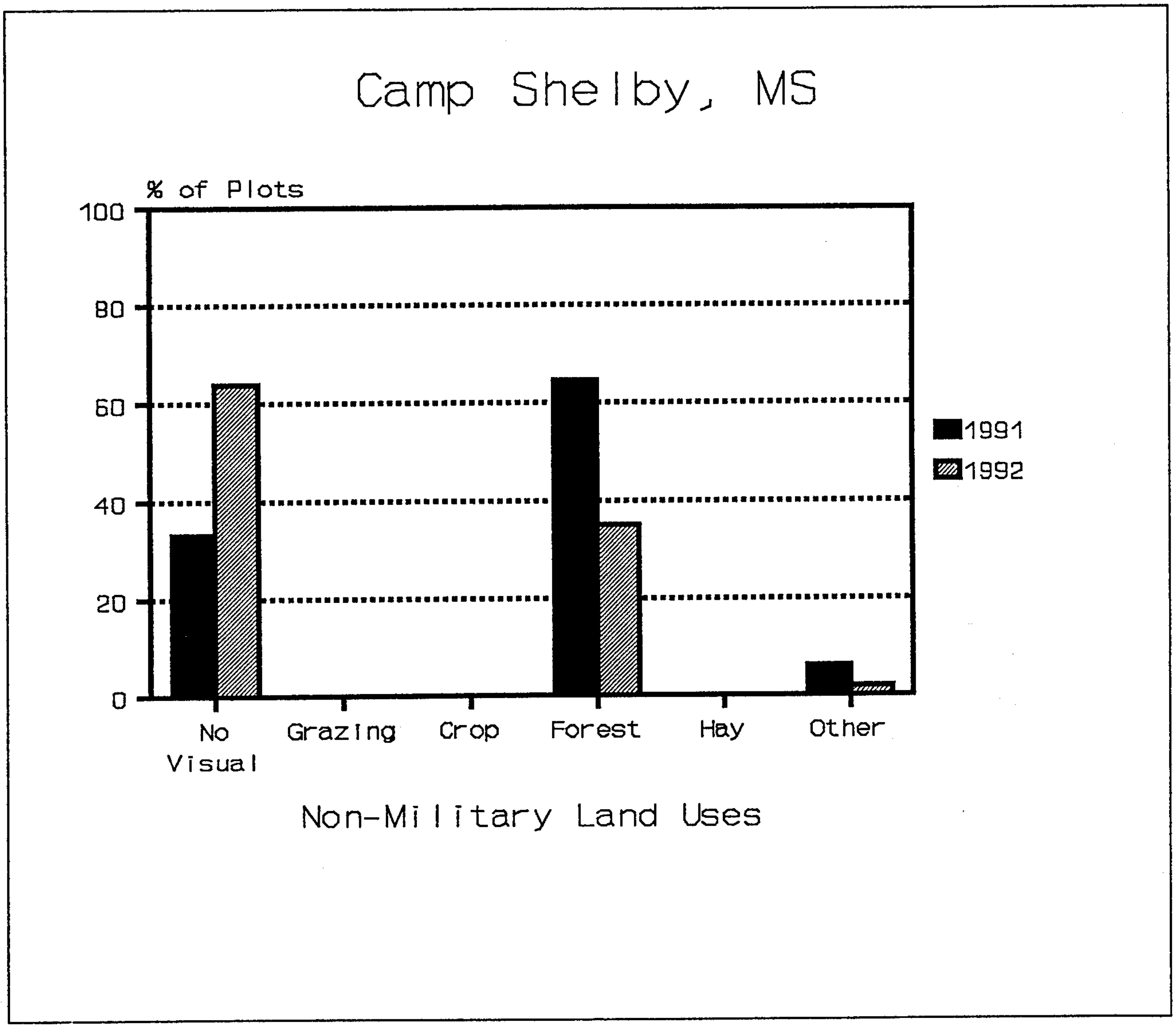

Figure 3-2 Non-Military Land Uses 1991-1992

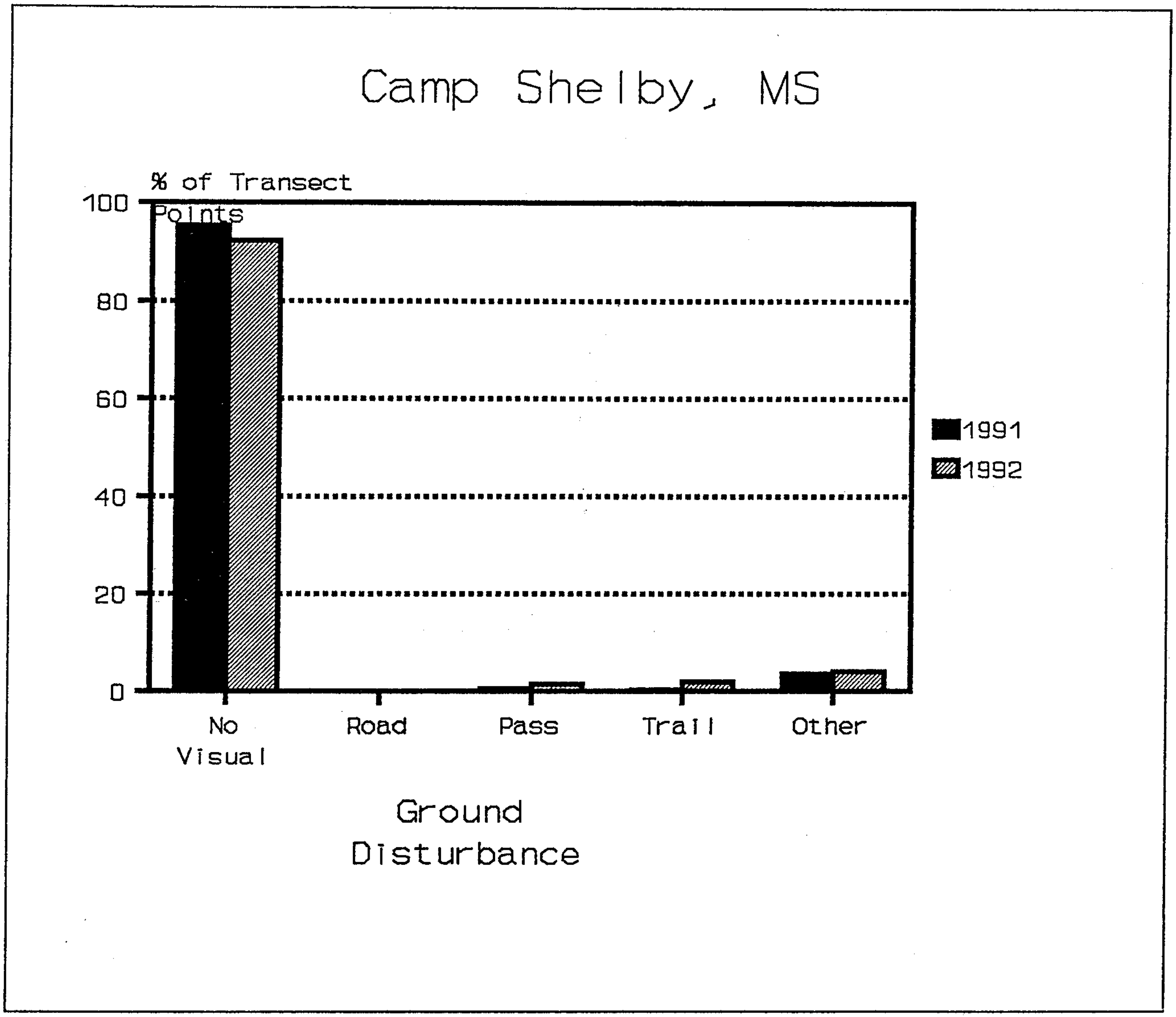

Figure 3-3 Ground Disturbance 1991-1992

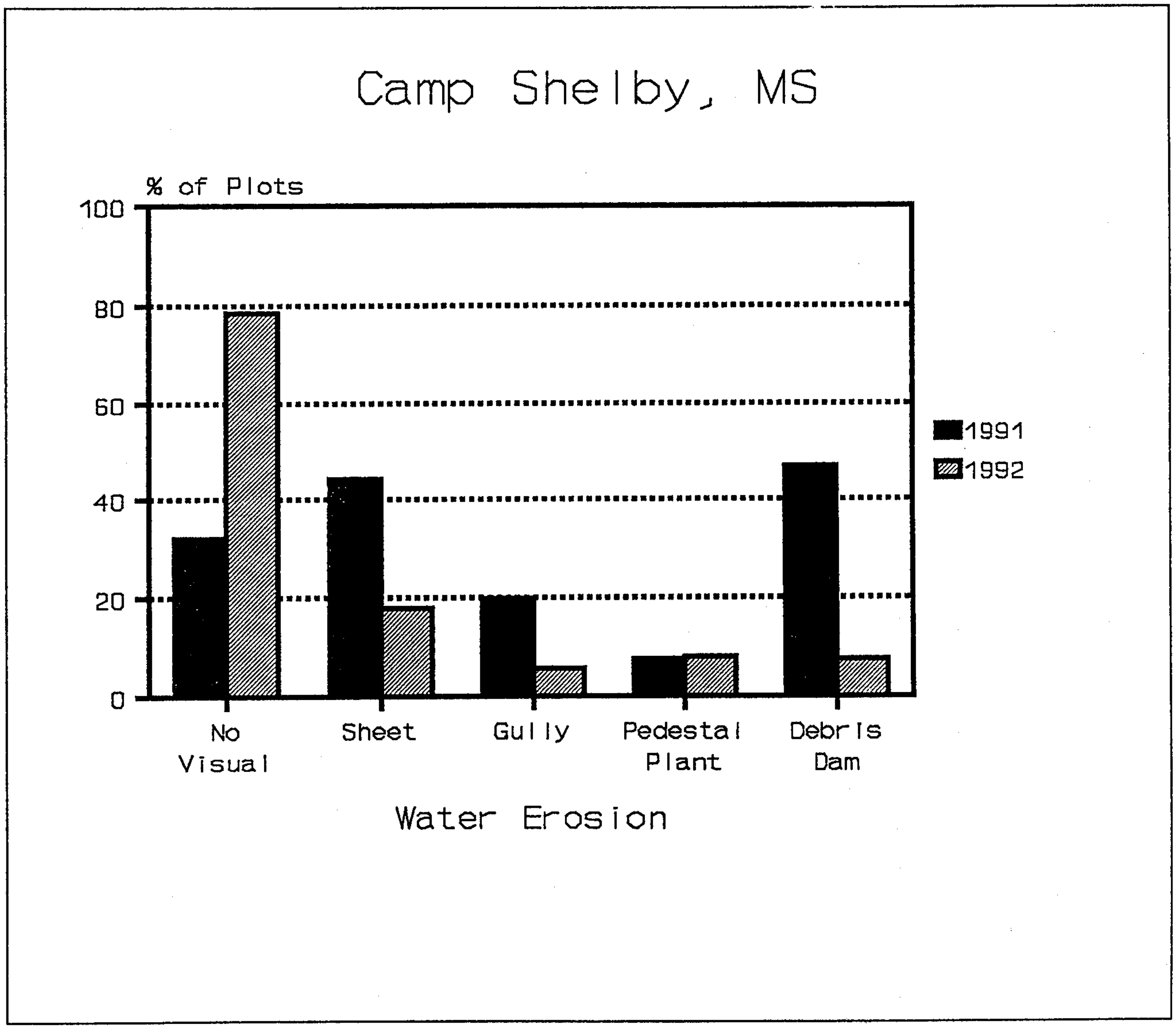

Figure 3-4 Soil Erosion by Water in 1991-1992

Sohne (1958) and Taylor (1982) showed that the compaction in the upper soil layers is determined by the tire contact pressure while the compaction in the subsoil is a function of total load of the vehicle. Erbach et al., (1986) reported that the yield of plants growing in tracks of a track-type tractor was 5 percent greater than the yield of plants growing in the track of a wheel-type tractor with higher soil pressure. The work of Erbach et al., shows little resultant difference between wheel-type and track-type compaction. On the other hand, Wittsell and Hobbs (1965), Gaultney et al., (1982), Gameda et al., (1985), and Schuler and Lowery (1984, 1986) obtained reduced yields which resulted from higher machine loads and thus increased soil compaction.

Compaction hazard depends on soil type and moisture. Sandy soils are not as susceptible to compaction. Clay and loamy soils can be seriously compacted when soil moisture exceeds their plastic limit. Heavy equipment should not be allowed on loamy or clay soils when the water table is within 12 inches of the surface or when the soil moisture exceeds the plastic limit.

Compaction hazard also depends on ground cover and number of machine passes. Most of the compaction occurs during the first three passes and little additional compaction occurs after 10 passes (Burger et al., 1985; Hatchell et al., 1970; Kreh et al., 1985; Moehring and Rawls, 1970; and Simmons and Ezell, 1983).

Soil compaction has the potential to: 1) decrease the infiltration rate, increase runoff, and decrease water storage, 2) increase the water content above a compacted surface layer by slowing the internal drainage of water, 3) decrease root growth. Compaction caused by heavy machinery on wet soils can extend to 24 inches and below. Since this is well below the depth of normal tillage, and even subsoiling, compaction is more likely to persist for several years.

The factors that influence vehicle movement cross-country, mobility, include variables which combine to determine the strength and other physical properties of soils, including topographic position, soil type, grain size/shape, soil moisture, plasticity, density, slope, vegetation, and micro-relief. Mobility is principally dependent upon bearing and traction capacities of vehicles which are, in turn, primarily functions of soil strength or shearing resistance. Bearing capacity is the ablilty of a soil to support a vehicle without undue settlement or rutting. Traction capacity is the ability of a soil to provide sufficient resistance between the moving track/wheel elements and the soil for necessary thrust to move the vehicle forward without undue slippage.

As part of the Integrated Training Area Management (ITAM) monitoring on Camp Shelby a limited study was conducted by the Army Waterways Experiment Station, using the cone penetrometer to evaluate past traffic use. This instrument provides dimensionless numbers termed *cone index* which can be related directly to soil shear strength. In general, the more traffic in an area, the greater the compactive effort and consequently the greater the cone index value. Sites were selected with varying vehicle use histories. Two USDA soil series, McLaurin and Susquehanna, were selected for evaluation. Sites currently receiving heavy

use, either wheeled or tracked, sites receiving heavy tracked use twenty-two years ago, and sites with no history of military use (virgin) were selected. The average cone index values at various depths within the soil matrix were plotted and appear in Figures 3-5A and B. Figure 3-5A represents the data from historical heavy use and virgin soils. Figure 3-5B represents data from current heavily used areas and control sites of no use. Some scatter was evident in the data due to the fact that readings may not have been taken specifically in areas with intense use or, within the control sites, may have been taken in areas which had recieved logging use but no military use.

A comparison of the figures shows that either limited or heavy tracked or wheeled traffic caused some compaction of these two soil types. In fact cone index values were nearly double those of virgin soils. The remedial effect of time is shown in Figure 3-5A as the twenty years since use has resulted in roughly halving the values within the first six inches. Only slight changes occurred at greater depths. Correlation of these changes with changes in the flora or fauna would be necessary to draw further concluslions from these limited data. More controlled tests utilizing various weight classes of vehicles during various seasons or climatic conditions in various topographic positions, with more controlled traffic, would be required to support modeling of the effects of military traffic on soil compaction.

Data collected as part of ITAM monitoring at Camp Shelby seem to indicate that heavy-use sites have a higher dry density than control sites. While this fits expected trends, the scatter in the data and variability between soils do not allow definitive conclusions to be drawn. Additional data collection is appropriate to assist in remediation procedures and frequency. Proposed mitigation procedures are examined in Section 3.5.2.1.2.

Table 3-3

Recommended Slope-Distance Relationships Construction of Wing Terraces

SLOPE	MAXIMUM SPACING
1%	400 ft
2%	250 ft
5%	125 ft
10%	80 ft
15%	60 ft
20%	50 ft

3.1.1.3.1 Roads And Other Transport Routes

Camp Shelby's road system consists of approximately 160 miles of paved roads near the reservation facilities, 360 miles of well established gravel roads, and an extensive network of tank trails, unimproved dirt roads, and trailways. Road ditch erosion prevention work has taken place throughout Camp Shelby. Road ditch turnouts and wing terraces are closely spaced on roads with steep grades to prevent the road from becoming a gully. The wing terraces are installed according to the specifications listed in Table 3-3. All the newly constructed terraces are seeded, limed, and fertilized as per guidelines of the Erosion Control Plan. In many locations waterbar diversions are constructed as per specifications listed in Table 3-4. Minor instances of road-side gully erosion are present which will be corrected to prevent further erosion.

Table 3-4
Waterbar Specifications
Unimproved Roads and Trailways

ROAD GRADE	MAXIMUM SPACING
1%	300
2%	150
3%	100
4%	75
5%	60
6%	50
7-8%	40
9-10%	35
11-13%	30
>14%	20

3.1.1.3.2 Soil Compacted Sites On Ranges And Tank Assembly Areas

As discussed immediately above, soil compaction has been a concern on ranges receiving heavy vehicular traffic. The Erosion Control Plan lists Range 18, Training Area T-19 (Drop Zone) and the Tank Assembly area at Redbud of T-28 as compaction problem areas. The Tank Assembly and the drop zone sites have been chiseled in the past to break subsoil compaction and then seeded for vegetation establishment.

In September 1992, a short-term study was designed and conducted on Camp Shelby to quantify the degree and depth of soil compaction on areas historically used for maneuvers as compared to control areas historically managed by the Forest Service for timber with no military maneuvers. Compaction was estimated based on the moisture content of the soil versus the dry density of the soil relative to "heavy use" (maneuver sites) versus "control" sites. At most sample sites the data indicate the increased densities (index of compaction) expected with vehicle traffic on maneuver sites (Figures 3-5 A and B). There is some scatter in the data, and that is expected because places in a particular maneuver area are naturally protected and skid trails and logging roads within the control areas are subject to compaction by logging vehicles. The data indicate that compaction occurs to a depth of 12 inches on repeatedly used sites, such as parking areas. This short term study supplied limited data but the data did provide useful information relative to the depth of compaction and increased soil density (compaction) on heavy use areas.

Heavy wheeled vehicles may compact more deeply than tracked vehicles, so all areas receiving traffic should be evaluated, not just tracked vehicle use areas. Dry soil conditions are required for proper compaction removal, so deep tillage may not be appropriate every year (if dry conditions are not present), even if compaction conditions warrant tillage. Traffic required to perform tillage and the tillage itself may magnify the compaction problem if performed in moist soil conditions. Detailed mitigation procedures are discussed in Sections 3.5.2.1.2 and 3.5.2.2.

3.1.1.3.3 Impact Area

Long-term military use of the impact area for artillery practice, coupled with frequent burning during training periods and scheduled annual burning has resulted in serious soil degradation problems. Inadequate vegetative cover, and sheet and gully erosion were common in the past because ground entry for practicing conventional agronomic and engineering land rehabilitation measures were prohibited.

Aerial broadcasting of seed and fertilizer is the only option to establish vegetation, to sustain soil fertility, and control soil erosion in this area. In order to meet this objective, Camp Shelby has prepared a master plan for the revegetation of the impact area through aerial seeding. The first aerial seeding project was completed during April, 1991. Aerial broadcast of seed and fertilizer was accomplished over a 50-acre test site. A mixture of three different species was applied at a seed rate of 102 lbs/acre while the rate of fertilizer applied was about 600 lbs/acre. The total project cost, including labor charges, was $7,000. Camp Shelby plans to continue aerial seeding and fertilization operations to achieve full revegetation of the entire impact area in succeeding years. This will be monitored as a part of Integrated Training Area Management (ITAM) implementation. Further discussion of the erosion control program is in Section 3.2.2.1.

3.1.1.3.4 Prediction of Soil Loss and Sedimentation

As discussed in Section 1.1.6, soil erosion and sedimentation analyses were performed using Geographic Information System (GIS) and soil erosion/sedimentation modeling techniques. The techniques are a combination of the Revised Universal Soil Loss Equation (RUSLE) technology along with modifications to utilize detailed terrain information as an alternative to traditional slope length and steepness parameters for RUSLE. The techniques were reported by Mitasova et al., (1993).

If current cover were maintained in perpetuity (no management), the estimated erosion rate would be 0.04 tons per acre per year (T/ac/yr) for a predomominately forested area such as PTA 1. Using the analysis described earlier in this section and elaborated on in Section 3.3.1.4., it is estimated that the present permit area, before applying current and proposed mitigation procedures, has an erosion rate of 0.96 (T/ac/yr). The erosion rate following implementation of these measures is discussed in Section 3.2.2.1.

The Cover (C)-factor, an estimate of vegetative cover, was estimated from current cover characteristics, Dissmeyer and Foster (1984) and Barfield (1981). Several land cover/disturbance scenarios were examined and will be described in appropriate sections of this document. The erosion and sedimentation characteristics of the current state of cover would not be indicative of U.S. Forest Service (USFS) management because disturbance is required for proper forest management, but the analysis to follow is still appropriate for comparison purposes.

The acceptable T-factor for forest production depends upon soil series and slope, Table 3-5 , and ranges from 0.68 to 0.81 (T/ac/yr). The T-factor assumes a slope of 9 percent for 150 meters. Table 3-5 displays the site specific erosion rates expected from various timber rotations and management practices. These tolerable values were developed by the U.S. Forest Service, based on Mississippi soils and forest practices (see Table 3-5).

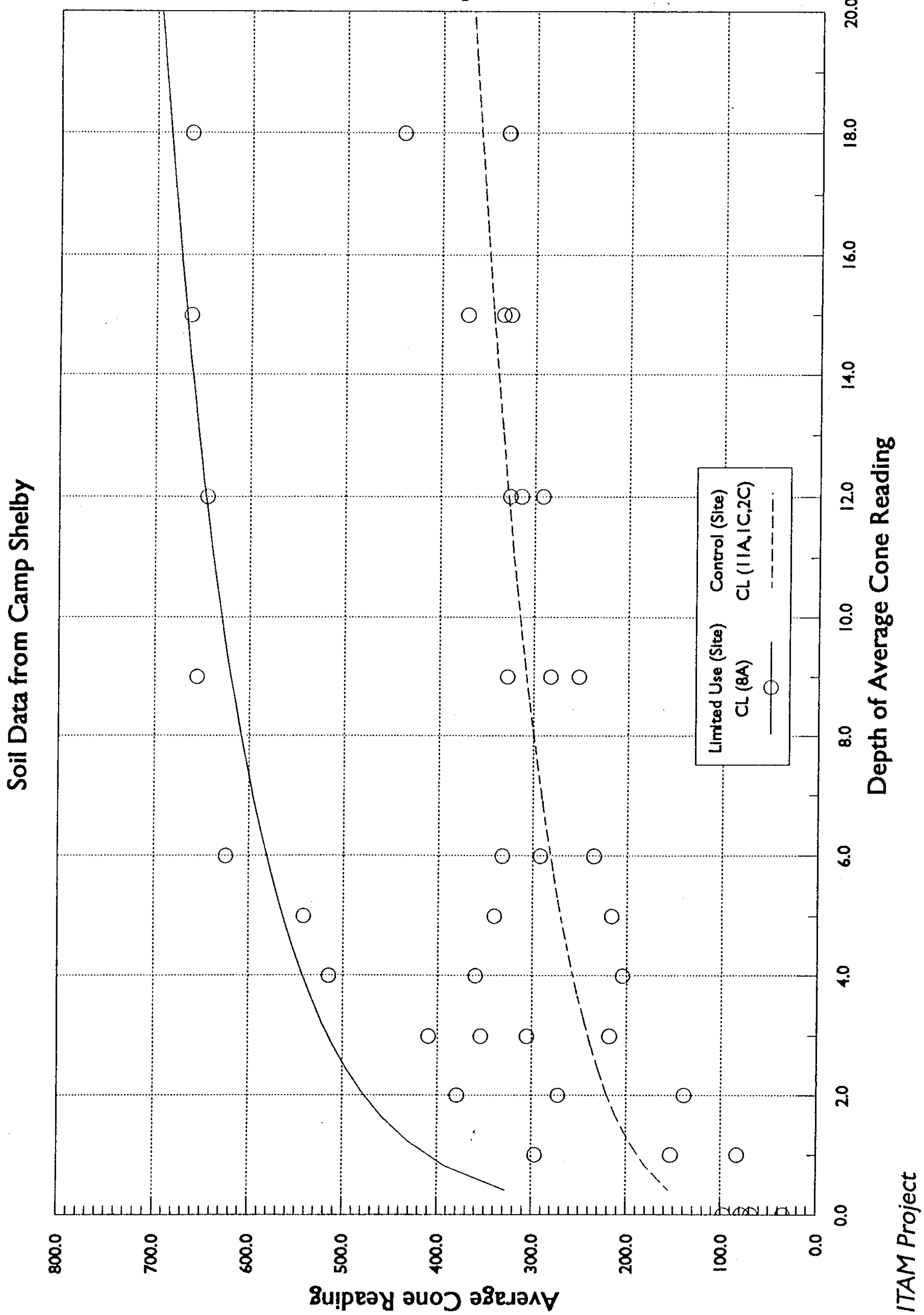

Figure 3-5 A Soil Compaction Index

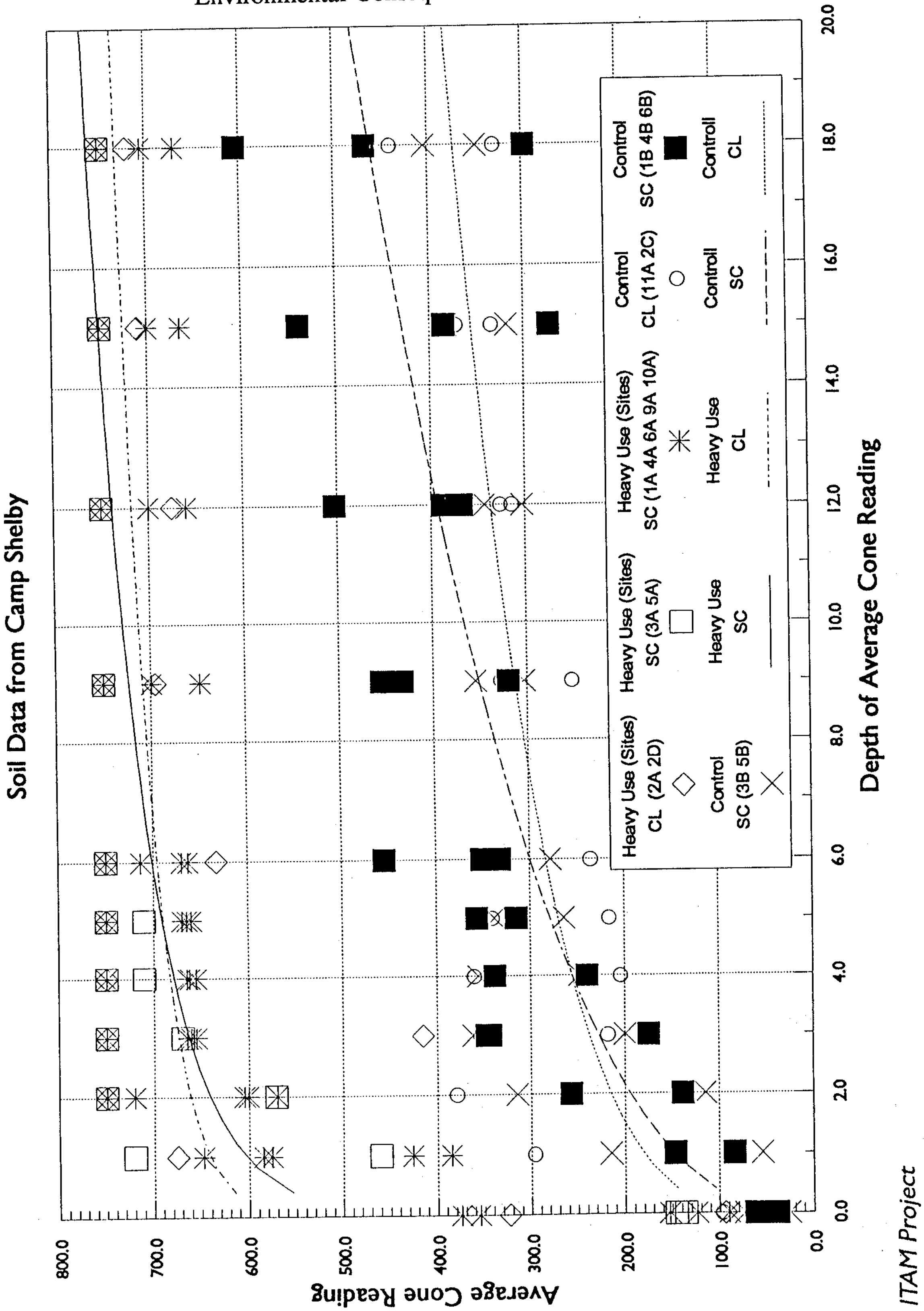

Figure 3-5 B Soil Compaction Index

3.1.1.3.5 Potential for Contamination of Soil

The potential exists for spills and leaks of fuel, lubricants, and coolants from vehicles and other mechanical equipment, largely as a result of accident and mechanical breakdown. Quantities are limited to no more than the contents of a single vehicle, and are typically very small. No intentional land disposal of any quantity of these products is allowed at any location on Camp Shelby.

Field refueling activities have the potential to result in spills of diesel and aircraft fuel and lubricating oil. For safety and environmental protection purposes, such actions have long been recognized as potentially hazardous, and their conduct is covered by a series of Army and Camp Shelby regulations which provide protective measures. See Section 3.2.2.3 for a discussion of these protective measures.

3.1.1.4 Surface Water and Wetlands

Current maneuver training activities have resulted in erosion processes that have caused sedimentation in some riverine wetlands on Camp Shelby (Weatherford McDade LTD., 1991 Section 4.8.1.2). Areas identified as critically eroded in the Erosion Control Plan for Camp Shelby were ranges 18, 40, 41, 43, and 44, tank assembly areas and the drop zone in T-19. In the past, undesignated wetland crossings were utilized by maneuver units, which has caused some wetland damage. Some soil movement has also occurred around the target areas of Range 45, however, no measurable impact on surface waters, including wetlands, has occurred. The training activities and facilities that are the primary cause of this excess sedimentation are: infantry ARTEP training, engineer ARTEP training and tracked vehicle maneuver and ARTEP training (see Section 2.1.1.2, Table 3-1 and Appendix C, part 8 for details). In the past, due to insufficient resources at the installation, not all of the recommended restorative and protective measures in the Erosion Control Plan were fully implemented. The result has been a less complete vegetative cover which allowed more soil loss than the target under the Erosion Control Plan. In 1992 and 1993, however, 100 percent of the remedial work needed was completed.

3.1.1.5 Groundwater

Current activities and current uses of groundwater at Camp Shelby have no significant effect on the quality or quantity of the groundwater (Weatherford McDade LTD., 1991). The average draw down of groundwater from the Hattiesburg formation within Camp Shelby area has been steady over the past 10 years at 0.64 feet per year. The average draw down from the same formation in the general southern Mississippi area has been 1 to 2 feet per year (Appendix H). Groundwater in the Camp Shelby area thus exhibits no abnormal effects as a result of military use.

Table 3-5 Tolerable Erosion Losses By Activities For Benchmark Soils (Pages 17-18)

Soil Series	Land Area	R-Factor	Slope %	Activities	T Factor	Predicted Erosion (Tons/Ac) per Rotation (Yrs)					Allowable Accelerated Erosion (Tons/Ac) per Rotation (Yrs)				
						40	50	60	80	100	40	50	60	80	100
Eustis	Upland	133-500	6	Burn, Thin, Log, Disc	.68	6.4	6.5	6.6	6.7	6.8	27.2	34.0	40.8	54.4	68.0
Lexington	Side Slopes	133-325	15	Burn, Thin, Log, Shear and Windrow	.81	13.7	14.5	14.9	16.0	16.7	32.4	40.5	48.6	64.8	81.0
			20	Burn, Thin, Log, Chop and Burn or Burn and Push Down	.81	7.2	9.5	10.2	11.8	12.9	32.4	40.5	48.6	64.8	81.0
			30	Burn, Thin, Log, Burn and Push Down	.81	16.3	19.0	20.4	29.7	25.7	32.4	40.5	48.6	64.8	81.0
			30	Burn, Thin, Log	.81	6.3	8.9	10.2	13.6	15.6	32.4	40.5	48.6	64.8	81.0
		134-400	15	Burn, Thin, Log, Shear and Windrow	.81	16.8	17.9	18.4	19.8	20.6	32.4	40.5	48.6	64.8	81.0
			20	Burn, Thin, Log, Chop and Burn	.81	11.9	11.7	12.5	14.6	15.8	32.4	40.5	48.6	64.8	81.0
			30	Burn, Thin, Log, Burn and Push Down	.81	20.1	23.4	25.0	29.2	31.5	32.4	40.5	48.6	64.8	81.0
	Side Slopes	134-400	30	Burn, Thin, Log	.81	6.6	11.0	12.6	16.8	19.3	32.4	40.5	48.6	64.8	81.0
Lucy	Upland	134-400	6	Burn, Thin, Log, Disc	.73	6.0	6.1	6.2	6.3	6.4	29.2	36.5	43.8	58.4	73.0
			15	Burn, Thin, Log, Shear and Windrow	.73	7.8	8.3	8.6	9.1	9.6	29.2	36.5	43.8	58.4	73.0

Soil Series	Land Area	R-Factor	Slope (%)	Activities	T Factor	Predicted Erosion (Tons/Ac) per Rotation (Yrs)					Allowable Accelerated Erosion (Tons/Ac) per Rotation (Yrs)				
						40	50	60	80	100	40	50	60	80	100
Lucy (cont.)	Upland	134-400	20	Burn, Thin, Log, Chop and Burn, Burn and Push Down	.73	4.7	5.4	5.8	6.8	7.3	29.2	36.5	43.8	58.4	73.0
			30	Burn, Thin, Log, Burn and Push Down	.73	9.3	10.9	11.7	13.6	14.7	29.2	36.5	43.8	58.4	73.0
			30	Burn, Thin, Log	.73	3.6	5.1	5.8	7.8	8.9	29.2	36.5	43.8	58.4	73.0
McLaurin	Ridge Top	133-500	6	Burn, Thin, Log, Disc	.75	7.5	7.6	7.7	7.9	8.1	30.0	37.5	45.0	60.0	75.0
Smithdale	Upland	134-400	6	Burn, Thin, Log, Disc	.80	8.4	8.6	8.7	8.9	9.0	32.0	40.0	48.0	64.0	80.0
	Side Slopes	135-400	15	Burn, Thin, Log, Shear and Windrow	.80	11.0	11.6	12.0	12.9	13.4	32.0	40.0	48.0	64.0	80.0
			20	Burn, Thin, Log, chop and Burn	.80	6.5	7.6	8.1	9.5	10.3	32.0	40.0	48.0	64.0	80.0
			30	Burn, Thin, Log, Burn and Push Down	.80	13.1	15.2	16.3	19.0	20.6	32.0	40.0	48.0	64.0	80.0
			30	Burn, Thin, Log	.80	5.0	7.2	8.2	10.0	12.5	32.0	40.0	48.0	64.0	80.0
Troup	Upland	133-500	6	Burn, Thin, Log, Disc	.68	6.4	6.5	6.6	6.7	6.8	27.2	34.0	40.8	54.4	68.0
			15	Burn, Thin, Log, Shear and Windrow	.68	8.3	8.8	9.1	9.8	10.2	27.2	34.0	40.8	54.4	68.0
			20	Burn, Thin, Log, Chop and Burn	.68	5.0	5.8	6.2	7.2	7.8	27.2	34.0	40.8	54.4	68.0
			30	Burn, Thin, Log, Burn and Push Down	.68	9.9	11.5	12.4	14.4	15.6	27.2	34.0	40.8	54.4	68.0
			30	Burn, Thin, Log	.68	4.0	5.4	6.3	8.1	9.5	27.2	34.0	40.8	54.4	68.0

3.1.1.6 Wildfire and Prescribed Burning

The Black Creek Ranger District averaged 90 large and small unplanned fires which burned an average of over 2,900 acres per year for the five year period 1987-91. An average of 22 wildfires per year or 24 percent, were in the Special Use Permit (SUP) area and accounted for over 2,000 acres or 69 percent of the acreage burned. Fires within the dedicated impact area and buffer averaged 4.4 fires and 1,807 acres per year. The remaining fires were the result of Range 40 activity and other maneuver and bivouac exercises. See Appendix U for an analysis.

Fires occurring outside the dedicated impact area buffer may be fought using direct attack strategy rather than indirect attack. This results in significantly lower acreage burned per fire outside the impact area.

Fires occurring in the fall are the more serious since critical ground cover is destroyed during the dormant season, leaving the soils exposed to the rains until re-growth in the spring. Nineteen of the 22 total impact area fires occurred during the period October through February while 44 of the 89 permit area fires outside the impact area occurred at this time.

Fire intensity is a criterion frequently used to estimate control difficulty and resource damage. The higher the intensity level, the more difficult the fire is to control and the more resource damage that occurs. There are six fire intensity levels. Those of level 3 and above cause high to extreme resource damage, principally to soil, soil organisms, and small ground dwelling wildlife. Fires of intensity level 3 and above occurred on 85 percent of the acres burned.

Fire danger rating is a combination of environmental factors (temperature, relative humidity, fuel moisture, wind speed, etc.) used to aid in manning and dispatching fire suppression forces. Normally, with similar fuel loads, the higher the fire danger, the higher the fire intensity. There are six fire danger rating categories, A-E and C+, with "A" being no fire danger and "E" being extreme. C+ is normally considered high-moderate and requires changes in manning and tactics. Thirty-two percent of the fires and 38 percent of the acres burned occurred on C+ and higher days.

The effects of low-moderate intensity controlled understory burns are described in detail in the Final EIS for "Vegetation Management in the Coastal Plain/Piedmont (1989) Volume 1" of the US Forest Service. Wildfires of similar intensity can be expected to have the same effects if occurring infrequently on areas previously prescribed burned.

A summary of these effects upon the various resources follows:

<u>Water</u>: Fire may increase stream sediments, stormflows, and sediment loads. In general, the amount of increase is dependent upon the severity of the fire. Intense fires expose mineral soil and promote surface run-off. Annual burning at low intensity in light fuels also exposes

mineral soil and would have the same effect on run-off and storm flows as intense fires in heavier fuels.

Air quality: Fire emits substantial quantities of gases and particulates into the atmosphere. Emissions are also dependent upon fire severity. Wildfires emit the same pollutants as prescribe fires. Camp Shelby range fires burn in very light fuels and therefore the emissions would be less than for prescribe outside the range areas. These fires may occur or burn into the night which may cause smoke dispersion problems and resultant intrusion into the smoke sensitive zones of Highways 49 and 98.

Soil: Fire has both favorable and adverse effects on soil. The relationship of these effects is dependent upon the severity of the fire and the fuels consumed. Favorable effects are temporarily enhancing nutrient availability, phosphorous recycling, and reduced soil acidity. Adverse effects are caused by soil heating, soil erosion, and nutrient leaching. Adverse effects from light to moderate burns occurring within a 3-7 year period are minimal. Annual burns in grasslands such as the Camp Shelby ranges pose a high risk to soil productivity by reduced litter biota, impaired soil porosity and infiltration, and reduced organic matter.

Wildlife: Because most animals in the Lower Coastal Plain are adapted to periodic fires of natural and man caused origin, direct mortality is rare and has a negligible effect on animal populations. Fires during the summer and spring nesting/rearing season can cause loss of nests and juveniles. If Camp Shelby range fires are more frequent than these species are adapted to, it may be expected to limit the success of birds and animals nesting and rearing in these areas.

Vegetation: Fire can kill or injure vegetation depending upon the intensity of the fire, the species involved, air temperature and humidity, length of exposure, and season of the year. Generally low intensity burns occurring during the dormant season top kill only small individuals of fire resistant species an lower midstory specimens of fire susceptible species. The frequent growing season burns on the Camp Shelby ranges have resulted in grasslands with occasional longleaf pine/low gallberry vegetative cover.

3.1.2 Biological Environment

3.1.2.1 Vegetation

The training activities that are the primary cause of damage to the herbaceous vegetation are (see Section 2.1.1.2 and Appendix C, part 8): bivouac and small unit tactics, convoy training, medical training, aviation training, supply and service training, artillery training, infantry ARTEP training, engineer ARTEP training, mortar training, engineer brigade training, Air Force Tactical Air Training, and tracked vehicle maneuver and ARTEP training (Table 3-1). Damage caused by these activities varies depending on the number of times a training area receives each type of use (Appendix C and Table 3-1). Current activities have not had a significant effect on threatened, endangered and sensitive (TE&S) plant species because most

occur in wetland areas and wetlands are designated as being off-limits to vehicles except at designated and improved crossings.

Current training and maneuver activities that cause damage to plant cover (ground and canopy cover) are off-road tracked and wheeled vehicle movement and explosive ordnance. In areas of intense tracked vehicle maneuver, native vegetation has been supplemented with winter annuals and other agricultural grasses. Because the seed mixtures used in revegetation are not 100 percent pure, exotic weeds are sometimes present in revegetated areas. The clearing of timber for lines-of-sight and frequent fires on impact areas of the various ranges have resulted in relatively sparse stands of low growing perennial vegetation, composed primarily of grasses and forbs. The particular sites where plant damage is critical are described in Section 3.1.1.3.

The maneuver areas receive prescribed burns on a 3 to 5 year schedule. Prescribed burns can help reduce the intense wildfires that may cause severe resource damage. Data from LCTA plots on Camp Shelby indicate that aside from the potential problem areas mentioned above, about 90-92 percent of the permit area has ground cover (basal plant cover) (Figure 3-6). The data also indicate that 90 percent of the permit area has canopy cover (above ground plant cover) (Figure 3-7). These figures are well within adequate ground and canopy cover values for the area.

Pesticides, including insecticides and herbicides, are used on Camp Shelby only for specific sites and purposes. No wide area applications of any material are made. Each individual application must be specifically approved by the USFS. In addition to the requirements of the EPA registration, herbicide use on National Forest Lands is strictly controlled and documented in the Forest Service Vegetation Management- EIS (1989). Regardless of the legality of the use of a material under label restrictions, only herbicides evaluated and accepted in the Forest Service EIS can be used on Forest Lands within appropriate guidelines after a permit (FS-2100-2) is approved, and the appropriate Environmental Assessment or Biological Evaluation has been completed (see Appendix V). The insecticides Diazinon (for control of fire ants) and commercial wasp spray fall within the same guidelines and have been proposed for use to control poisonous insects in and around range facilities. The herbicide glyphosate (Roundup®) has been approved for use in maintaining firing points, moving target arrays, and similar firing range locations. See Appendix V for all currently applicable assessments conducted for National Guard use of pesticides in the special use permit area at Camp Shelby.

3.1.2.1.1 Proposed Botanical Areas

Both the Loblolly Bay Area and the Ragland Hills Area (north of Lee Avenue) are off-limits to motorized vehicles. They are available for foot travel, compass courses, etc. Therefore, there are no maneuver effects on this area. Some very small effects from foot traffic are likely, however they appear too small to measure.

3.1.2.2 Agriculture

The existing military training activities have had no identifiable effect on those agricultural enterprises which are found in the vicinity of Camp Shelby.

3.1.2.3 Forestry

Species of economic importance are described in Section 2.4.3. The National Forest timber resource is managed under the principle of Long Term Sustained Yield Capacity. This is the highest uniform wood yield which may be sustained indefinitely under a specified management intensity from lands determined to be suitable for timber production. This management intensity must be consistent with other resources and multiple use objectives.

Current military activities conflict with standard U.S. Forest Service (USFS) timber management practices and result in some limits for other resource management on approximately 39,100 acres within the present SUP area. These are areas set aside for firing ranges, air strips, tank maneuvers, etc. and are considered by the Forest Service to have been removed from the managed timber land base. Some minor harvests may take place on these military use lands, but there is no schedule for harvest and no reliable estimate of yield is available. Effects of this existing withdrawal from the regulated forest base have been accounted for in the volume estimates in the National Forests in Mississippi Land and Resource Management Plan (1985). Resource management is not as severely affected on the remaining 77,099 acres of the permit. Small quantities of timber may be harvested as a result of various construction and maintenance projects. Occasional root and stem damage may occur during non-tracked vehicle field exercises. This may lead to insect damage which could result in small timber salvage sales.

Under the current Special Use Permit, there are 14,799 acres potentially available for tracked vehicle maneuvering on 15 separately designated areas constituting 7 different maneuver units. Additional proposed and implemented environmental constraints have reduced the tracked vehicle training area to 9,300 acres, Table 1-4. Of this area, approximately 2,800 acres had been thinned to a 24 by 24 foot spacing and 3,500 acres had been cleared of timber following the developement of the tracked vehicle training areas in 1973.

Two areas originally designated for tracked vehicle training are no longer used for tank training. Area T-44 comprising approximately 2,200 acres, has been declared off-limits by the National Guard for tracked or wheeled vehicle maneuver. This area is to serve as a Gopher Tortoise refuge and study area for Camp Shelby environmental personnel. Area T-50, 1,517 acres, was withdrawn about ten years ago by mutual agreement between Camp Shelby and the Forest Service.

Many of the previously cleared and thinned areas have received no maintenance since 1982 due to the M60A3 firing program, a proposed consolidated tank maneuver area, and subsequent EIS studies. Should Alternative 4 be selected, these previously cleared areas will require maintenance clearing of the 10-15 year old growth. Some additional thinning will be

necessary to maintain a currently desired 30 by 30 foot spacing. It should be noted that all timber impact analysis for Alternative 4 treated these areas as currently cleared or thinned with no consideration for maintenance volume removal.

The consolidated tank maneuver area proposed in 1984 comprised 14,273 acres, most of which were in currently designated areas. Of this acreage 12,096 were non-wetland and available for use. It was proposed to thin 5,600 acres to 30 by 30 foot spacing and clear a total of 8,200 acres including the 3,500 acres which had already been cleared. The clearing had been increased to about 5,600 acres when implementation was suspended.

From 1986-1990, 73.2 million board feet (MMBF) were harvested from the Camp Shelby permit area (Table 3-6). This represented 51 percent of the volume harvested from the Black Creek Ranger District, of which the permit area represents 49 percent. This timber had a total value of 8.4 million dollars and was purchased by 27 different individuals and 10 different companies. The USFS Implan economic forecasting model indicate that from 14 to 20 woods jobs are provided by every 10 MMBF of stumpage (standing trees). Purchasers located within the 5 county economic region accounted for 84.6 MMBF of the timber sold on the Black Creek Ranger District during this period.

Table 3-6 Timber Sale Record

Camp Shelby Permit Area			Black Creek Ranger Area	
Fiscal Year	**Volume (MMBF)**	**Value***	**Volume (MMBF)**	**Value***
1986	25,821	2,576	36,567	3,844
1987	13,834	1,569	27,077	3,168
1988	7,243	788	32,269	3,332
1989	8,566	1,279	29,566	3,383
1990	17,758	2,206	18,673	2,321
Total	73,222	8,418	144,152	16,048

* Dollar amounts given are in thousands.

Table 3-7 Potential Timber Harvests				
Period	1(1990's)	2(2000's)	3(2010's)	4(2020's)
Tank Maneuver Areas				
Volume*	27.73	37.46	49.43	47.91
Stumpage**	3,674	4,963	6,521	7,048
All Military Use Areas (excluding artillery impact area)				
Volume*	41.46	54.78	68.87	70.31
Stumpage**	5,727	7,932	10,191	10,095
* Volume is in MMBF (millions of board feet). ** Stumpage is valued in thousands of dollars.				

Closing of the tank fan during weekdays, as had been the practice for the six year period 1985-1991 under the M60A3 tank gunnery program, seriously affected the opportunity for timber harvest on about 16,000 acres for several years. The USFS postponed selling timber in this area because of the difficulty the purchaser would have had in accessing the timber sale area for significant time periods. Sales schedules were adjusted to make replacement sales on other portions of the Black Creek Ranger District. This weekly closure ended September 30, 1991.

The effects on forestry from current military use of National Forest lands is one of lost opportunity for normal forest management. The amount of opportunity lost is dependent upon the individual resource and the intensity of the military use on a given area.

Current tank maneuver areas were established in 1973. These areas were withdrawn from the managed timber land base. The timber stands on some of these areas were modified by clearing and thinning to accommodate tank usage. Table 3-7 estimates the timber volumes to be produced if the current tank maneuver areas were returned to National Forest management and also if all use areas, excepting the main artillery impact area, were to be returned to normal management.

U.S. Forest Service (USFS) timber receipts are deposited directly to the U.S. Treasury. Monies to administer the timber and other resource programs are appropriated by Congress based on planned need. Another source of funding is the KV fund (see Appendix O for a discussion). KV monies are deposits from timber sales for work to be done on sale areas and are in a separate account, expenditures from which are capped annually by Congress.

3.1.2.4 Fish and Wildlife

Current training activities and facilities that affect fish and wildlife habitat (see Section 2.1.1.2 and Appendix C, Part 8) either positively or negatively by the creation of edge or early successional habitat are: a) bivouac and small unit tactics; d) aviation training; j) infantry ARTEP training; k) engineer ARTEP training; r) tracked vehicle maneuver and ARTEP training; u) tank gunnery training (Tables 3-1a and 31-b).

These effects on resident wildlife at Camp Shelby are difficult to quantify. As a general rule, activities on military installations tend to open up the canopy of forested areas, creating a moderate to dense understory in areas not subject to traffic, and a fairly open understory in bivouac sites and around firing points. Loud or frequent noise generated from military activities has the potential for negative consequences on wildlife, and a separate discussion of the effects of noise on wildlife can be found in Section 3.1.5.4. The clearing or thinning of timber to provide firing lanes around the perimeter of the impact area has benefitted those species requiring open fields dominated by herbaceous plants and low-growing shrubs, as well as those requiring forested areas with an open canopy and a light to moderate understory growth. The expansion of edge-like habitat into the forest has not benefitted those species requiring conditions more representative of forest interior such as the brown-headed nuthatch, pine warbler, and the pileated woodpecker. The eastern wild turkey and northern bobwhite quail depend on these areas as a source of insects to feed their young, as do many other game and non-game species. Preliminary analysis of Land Condition-Trend Analysis small mammal trapping conducted for this Final EIS indicates that small mammals tend to be more abundant in areas dominated by herbaceous vegetation interspersed with woody plants than in closed-canopy forested areas with a sparse vegetative ground cover. However, not all wildlife species can tolerate edge or early successional habitat, so Camp Shelby activities have somewhat altered animal distribution.

3.1.2.5 Threatened, Endangered, and Sensitive Species

<u>Gopher Tortoise</u>: In September of 1993, the U.S. Fish and Wildlife Service (USFWS) issued their biological opinion of the proposed actions on the gopher tortoise at Camp Shelby (Appendix L). In their opinion issued to the U.S. Forest Service, the USFWS determined that the direct and indirect effects of past and present actions, as well as cumulative effects, are not likely to jeopardize the continued existence of the gopher tortoise.

A separate Biological Opinion sought in 1992 by the Army resulted in similar conclusions, The service also concurred with the 1992 biological assessment in agreeing that joint management (Camp Shelby and the USFS) "...have no doubt greatly increased the prospects for long term survival and recovery of the western population." This determination was made on the premise that current and proposed recommendations and guidelines are followed.

The impact of present military activities on the gopher tortoise is difficult to quantify. While additional research is needed, there is little current information regarding direct mortality (roadkills, artillery) or indirect mortality (e.g., habitat loss) of tortoises attributed to military

sources, nor is there information on whether these losses are greater than or less than that attributed to the areas' civilian community. A more in-depth discussion of the habitat requirements, management, and conservation recommendations for the gopher tortoise can be found in the Biological Assessment of the Effects of Continued/Proposed Military Training Activities on the Federally Threatened Gopher Tortoise, *Gopherus polyphemus*, on selected Lands at Camp Shelby, Mississippi (Wester and Swing, 1992). The study area consisted of approximately 125,000 acres (52,000 hectares) of existing and proposed tracked-vehicle areas on Camp Shelby. The leading causes of mortality were reported to be predation by humans and other predators (e.g., armadillos, raccoon, and fire ants), and vehicles. Ongoing survey data indicate approximately 2100 active burrows, an increase from the 413 burrows reported in the 1989 biological assessment. This increase in active burrows is attributed not only to new burrows being constructed, but also to increased coverage of the permit area, and the possibility that some of the burrows discovered could have simply been overlooked. Surveys are ongoing to locate and determine active/inactive status of gopher tortoise burrows.

The designation of training area T-44 as a gopher tortoise refuge should reduce the potential for vehicular mortality in this area, as it is off-limits to military and civilian off road vehicles. In 1988, a survey was performed in a 2,225 acre area. This 2,225 acre area contained approximately 104 active burrows (Mount et al., 1988). A long term study will be required to accurately determine the impact of this refuge on the gopher tortoise population at Camp Shelby.

Red-Cockaded Woodpecker: Red-cockaded woodpecker colonies in the region have declined over the years. Active nest trees on Camp Shelby were last recorded in 1990 (Schnel and Chapman, 1991). This overall decline has continued in spite of the fact that red-cockaded woodpecker foraging habitat on federal and state lands, including Camp Shelby, has improved since the species received protection in 1970 (Hooper et al., 1980). The U.S. Forest Service (USFS) has altered timber management practices, benefiting the red-cockaded woodpecker on land under its administration, which has probably helped offset largely unregulated timber removal on private lands throughout the region. The USFS is preparing an EIS on the long term management strategies to be followed with respect to the Red-cockaded Woodpecker.

Since much of Camp Shelby is under USFS administration, military activities have not resulted in any known negative impact to the red-cockaded woodpecker, as the Implementation Guide for the Red Cockaded Woodpecker During the Interim Period (U.S. Forest Service Southern Region, 1990) recommendations and guidelines are strictly adhered to. In addition, all known colony sites and nest trees have been fenced off, posted off-limits, or otherwise marked to reduce disturbance. An on-going effort to educate military personnel and the public is also thought to help in this regard.

Louisiana Black Bear: A few sightings have been reported in the permit area in recent times for this relatively wide-ranging sub-species. Black bear seldom adapt well to the presence of humans, and seem to prefer the more remote forested areas. The compounding effects of fairly extensive timber cutting, military disturbance and human habitation within and adjacent to the permit area has undoubtedly reduced their use of this area.

Camp Shelby Burrowing Crayfish: The Camp Shelby burrowing crayfish, a potential candidate for federal listing, has most likely not been impacted by existing activities (Fitzpatrick, 1991). This species superficially resembles the Lavender burrowing crayfish, and is strongly associated with pitcher plant bogs (these areas are off-limits to vehicles and military training) found in a number of areas on Camp Shelby (Appendix E). This species has not been documented in other areas of the state or country. The combination of this species' dependence on pitcher plant bogs and the militaries avoidance of these sites has probably reduced the potential for direct negative impacts to the Camp Shelby crayfish population. Indirect negative impacts to the crayfish might occur from the alteration of the natural nutrient flow into and through the bogs. Frequent fertilization in adjacent areas, as a result of land rehabilitation efforts, could potentially elevate the nitrogen levels in the bogs to a point where ecosystem damage occurs.

Gulf Sturgeon: This recently-listed fish is known largely from the lower reaches of the Pascagoula basin, with one 1993 record from the Leaf River near McClain. Based on what is known of its life history, it most likely spawns in clear, deep waters with a rocky, even bedrock, bed. No suitable habitat occurs on Camp Shelby, so any effects must be secondary, and would probably be related to soil loss and the potential for siltation of a spawning site. No such effects have been documented, and only a minority of the Camp Shelby drainage flows into the Leaf River system.

Other listed animal species found in the area occur in such low numbers on Camp Shelby, if at all, that an accurate assessment of the effects of military activities on them cannot be made at this time. Equally important, however, little information about life histories exists for some of the lower profile species making a reasonable assessment difficult and highly speculative.

3.1.2.6 Biodiversity

Habitat disturbances are a common occurrence in many if not all ecosystems. These disturbances can be from a non-living source (e.g., fire or hurricane) or biotic source (e.g., animal or plant induced), and might occur regularly enough that some scientists no longer consider them disturbances at all, but rather as natural events required to maintain the ecosystem. The regularly occurring overflow of the Mississippi river onto adjacent floodplains, and the role of fire in maintaining the longleaf pine ecosystem are examples of disturbances required to maintain an ecosystem.

Present military activities can negatively influence biodiversity if the forest is further fragmented, additional permanent edge is created, or keystone species (species that provide important food, habitat, or other ecological values) are adversely affected. The federally threatened gopher tortoise contributes to biodiversity at every level not only because of its strong association with the longleaf pine ecosystem but also because of the burrows it constructs. Approximately 75 other species of animals (including many invertebrates) are known to be associated to varying degrees with gopher tortoise burrows (Ken Gordon, personal communication, 1993), one of which is the federally threatened eastern indigo snake. A reduction in the tortoise population could potentially have a negative ripple effect on many

other animal species and the plants associated with the tortoise. The gopher tortoise and other listed species receive special protection under the Endangered Species Act, and therefore no negative effects to threatened, endangered and sensitive (TE&S) species are expected under current activities. In their most recent biological opinion (1993) on the gopher tortoise, the USFWS concluded that "...current military training activities are not directly impacting the gopher tortoise." The beaver, another native species to the Camp Shelby permit area, also contributes to habitat alteration. The beavers' impact on diversity is well known, and as military activities avoid wetlands, except at improved crossings, no direct impacts are expected. The red-cockaded woodpecker, however, has not fared as well on Camp Shelby, even though suitable habitat was set aside for the colonies by the USFS and the areas are given protection from most military activities.

Forest fragmentation is a major factor in the decline of many species in this country and worldwide. A growing body of evidence indicates the potential of forest fragmentation to adversely affect the presence and reproductive success of area-sensitive species (Rosenfield et al., 1992). In other geographic areas, the creation of edge corridors through contiguous tracts of forest has allowed the brown-headed cowbird (a brood parasite) and the blue jay (a predator) to expand their populations and distributions at the expense of other species. Predators and brood parasites of forest interior species are among the few species that have most likely benefitted. Few cowbirds were observed on the LCTA study plots, based on the results of the 1991 and 1992 spring bird surveys. However, they should continue to be monitored since they are brood parasites and have the potential to negatively affect reproductive success of numerous other bird species (Brittingham and Temple, 1983; Finch, 1991).

The permit area is administered by the U.S. Forest Service (USFS), whose normal guidelines regarding timber management are followed. Unless a new facility is constructed and additional timber cut, normal military training activities by themselves do not fragment the forest. Because of the need for permanent open areas in line-of-sight exercises and for roads and facilities, military activities contribute towards maintaining the permit area in its present level of fragmentation.

Tracked vehicle maneuvering is another military disturbance having a direct influence on biodiversity, and at present is restricted to 15 training areas. However, some post World War II tank maneuvering did occur throughout the Camp Shelby permit area until about 1972. Unfortunately, accurate records were not maintained as to frequencies, intensities, and locations, but the former Camp Shelby Training Site Commander confirmed that tanks did maneuver throughout the permit area, including what is now the Leaf River Wildlife Management Area (COL L. Redmond, personal communication, 1992). This tracked maneuvering could have potentially affected biodiversity, but the impacts appear to have been few, as any visual remnants from this activity are not readily noticeable today. A more in-depth discussion of the effects of tracked vehicle activity on soils, wetlands, vegetation, wildlife, and TE&S species is provided in Sections 3.3.1.3, 3.3.1.5.1, 3.3.2.1, 3.3.2.4, and 3.3.2.5 respectively.

A majority of the rare, special concern, or sensitive plant species (e.g., myrtle holly, silky camellia, and Harper's yelloweye grass) known or thought to occur on Camp Shelby (Section 2.4.5.2) are found in pitcher plant bogs and other wetland types. Wetlands are off-limits to military training, thereby avoiding direct negative impacts to these species and the structural integrity of the wetland. In the absence of mitigation, it is possible that activities outside the wetland's buffer zone could have had indirect negative effects on biodiversity within the wetland from nutrient (e.g., nitrogen) or sediment overloading.

Pitcher plants and other carnivorous plants are highly adapted at satisfying their nitrogen requirements by trapping insects, rather than relying on nitrogen deficient soils. An increase in nitrogen, such as the application of fertilizer in a mitigation program, could allow invading plant species to become established in these areas when they would not have otherwise. Not only would this negatively affect pitcher plants, but would also change the species composition of the community. Limited observations in some of these areas do not indicate this situation is occurring, but additional monitoring is needed to ensure that wetland communities on Camp Shelby continue to be representative of the region.

Another area unique to Camp Shelby is the Ragland Hills Area. Forming the upper slope of the Leaf River watershed, the area contains rolling hills, streams, and an unusual assemblage of vegetation. Unlike the majority of the permit area, the Ragland Hills Area (north of Lee Avenue) is not managed for timber production, and continued protection will only enhance its contribution to biodiversity. Military activities in this area have been limited to very light foot traffic, with no negative impacts on biodiversity identified to date.

Vegetative ground cover provides cover and food for wildlife, reduces soil erosion, allows the soil to absorb water, and assists in maintaining ecosystem integrity. Disturbance and erosion are thus considered important factors in influencing biodiversity, especially at the local (microhabitat) scale. Based on 1991 LCTA data, approximately 680 of the nearly 15,000 data collection points were classified as being man-induced disturbances (5%). The frequency of bare ground samples increased from 9 percent (undisturbed) to 26 percent for disturbed points. In addition to bare ground, litter, dead wood, vegetation, and rock/gravel are some of the other ground cover categories used to characterize each point. Block and others (1991) state in their 1990-1991 Camp Shelby LCTA installation report, "...the qualitative observations indicate a low level of military use, with foot use (low impact) observed most. In contrast, non-military use occurred on two-thirds of the plots, with forestry (high impact) being the primary use. Maintenance activities were observed on half of the plots, consisting primarily of prescribed burns. Erosion by water accounted for 98 percent of all erosion observed, occurring on two-thirds of the plots. Erosion was highest on plots with no observed maintenance, and lowest on planted/reseeded plots. Plots with military and/or non-military use displayed 10 to 20 percent less erosion than plots with no use. Erosion was observed on 85 to 100 percent of the training areas, soil types, and landcover types sampled." Block and others (1991) summarize their discussion by concluding "...While erosion is often a consequence of military and/or non-military use, the land use observations imply that erosion at CSTS [Camp Shelby Training Site] is as likely to occur on undisturbed areas as on

disturbed areas." In other words, while erosion is a result of many military activities, the present mitigation measures appear to be greatly reducing the negative impacts.

Unlike some natural disturbances, military or civilian induced disturbance appears to have a greater potential to disrupt or alter ecosystem processes, functions, and species distributions. This disruption is more likely to occur because the "artificial" disturbance frequently does not closely approximate a similarly occurring natural event. The magnitude or frequency of disturbance is different, the area involved is a different size, or land-use is more/less permanently changed by removing the naturally occurring recovery cycle. Some of these impacts occur from current military activities. Current U.S. Forest Service burning cycles of 3-5 years could reflect the natural frequency for many of the training areas, but it is more likely that multiple burns per year associated with the impact area (a USFS no-management area) and its associated ranges do not. Accidental fires started by training activities may have altered the vegetative structure and species composition in small areas, most of which are short-term, but nonetheless can be disruptive to wildlife and plant communities.

3.1.3 Quality of Life

During the analysis of public comments received following distribution of the Draft EIS, several issues were identified as needing additional examination in the Final EIS. "Quality of Life" (QOL) was one such issue (see Sec 1.1.7.2). As used here, QOL refers, collectively, to those issues which affect people going about their daily lives. There are a small number of camp sites, houses, and church buildings located on private property within the special use permit boundary. There are also approximately 1100 residences, 49 camp sites, 27 church buildings and 6 schools located adjacent to (i.e., within 1 mile of) some part of the special use permit area of Camp Shelby. The towns of Mahned, New Augusta, Beaumont, and McLain lie along Highways 98 and 57, adjacent to the SUP area. The towns of McLaurin and Brooklyn (along Route 49), and Janice (along Highway 29) also lie adjacent to SUP boundary of Camp Shelby. Many of these residents, church buildings, etc., have been there for many years, including recent decades while there has been active military training in progress at Camp Shelby. Figure 3-8A shows the distribution patterns of residences, churches, schools and other potentially sensitive human land uses. In Figure 3-8B, a comparison is made of these potentially sensitive land uses with the impulse noise contour for this area. Noise is examined specifically in Section 3.1.5, following.

Road Closure: IDT now takes place 28 weekends a year outside the midsummer months. AT takes place during the months of May through August. Since there is no school on weekends and during summer months, school kids aren't affected except during the month of May. When training activities interrupt traffic flow on Highway 29, there is a standard operating procedure (SOP) followed to temporarily close Highway 29 for short periods of time. This SOP and policy on movement on roads and trails is provided in the Camp Shelby Regulation, Annex C (1993). According to this policy, use of road guards are required to control on-coming traffic while a convoy is moving through an intersection. A typical convoy crossing could last 10-15 minutes per convoy with an approximate 10 minute interval between

convoys. The number of convoys crossing Highway 29 and other public roads for a battalion level task force training exercise could consist of 5 to 6 convoys containing approximately 15 to 17 vehicles.

Typically convoy crossing during IDT is between the 1600 hours on Friday and 0800 on Saturdays to conduct convoy movements *to* the field training areas. Convoy crossings across Highway 29 from the field training areas back to main post typically would be between the hours of 0700 and 0900 on Sunday. Church services are usually between 0800 and 1200 on Sunday. The public comments indicate that there is occasional to regular conflict with the conduct of Sunday morning church services at some locations.

Convoy movements across highway 29 for a battalion level task force during AT are similar to that of IDT. During AT, convoy movements typically begin on Saturday and may occur between the hours of 1400 on Saturday and completing incremental company size movements to the field by 1600 on Sundays. During AT, it is likely that more than one battalion task force may move to the field to conduct training operations, thus accounting for these longer movement times. However, this does not mean that units will be convoying from 1400 on Saturdays to 1600 Sundays. For example, two battalion task forces may take one afternoon to convoy across, take a break at night for rest and resume movements the following morning. Actual configurations and number of convoy crossings may vary depending on the number of units needing to move to the training areas east of highway 29. However, the duration of convoy crossings across highway 29 still remains 10-15 minutes per group, and may be repeated several times per day.

Dust formation: Density and duration of dust that is generated from moving vehicles will depend on the moisture in the road bed. The density and size of the "dust cloud" created depends on the number and type of vehicles moving at one time. The dust cloud may increase when multiple convoys occur. During these times, the trails are kept moist by sprinkling water on them. Prevailing winds on the installation may cause the dust clouds generated by vehicle movement to migrate into the adjacent wood lines. If there are no prevailing wind conditions, the sand and dust particles thrown into the air by vehicle movement will settle back down on the ground within a few minutes.

Smoke Operations: Armies have used smoke to confuse and deceive their enemies throughout history. Obscurants are man-made or naturally occurring particles suspended in the air that block or weaken the transmission of a particular part of the electromagnetic spectrum, such as visible light. Fog, mist, dust, smoke are all examples of obscurants. Smoke is an artificially created obscurant normally produced by burning or vaporizing some product. An example is the vaporization of fog oil to produce smoke from a mechanical smoke generator. It is the responsibility of the Unit Commander to plan and map the affected area through air or ground reconnaissance. The commander coordinates the mission with supported and adjacent units as well as with the Camp Shelby Range Control. The Field Manual FM 3-50 (for the Department of the Army on Smoke Operations) is followed for such missions.

Noise: Noise generated from firing ranges, tank trail and convoy activities, as well as from fixed and rotary wing aircraft operations also affects quality of life of residents nearby. The section on Noise (3.1.5) describes potential noise impacts from vehicles and aircraft. There is a standard operating procedure (SOP) in place for recording and investigating noise complaints (1992). The Camp Shelby Range Control Officer is appointed as the Noise Complaint Officer.

3.1.3.1 Social Environment

Camp Shelby lies in southeast Mississippi and covers portions of Forrest, George, and Perry Counties. Population counts for these counties were derived from the 1980 and 1990 population reports from the Bureau of the Census and accessed through the Economic Impact Forecast System (EIFS) of the Environmental Technical Information System (ETIS). Forrest county population increased from 66,018 residents in 1980 to 68,314 residents in 1990. George county population increased from 15,297 residents in 1980 to 16,673 residents in 1990. Perry county population increased from 9,864 residents in 1980 to 10,865 residents in 1990. In 1989 the three counties aggregated showed an average income of $23,615. Average income is projected to rise to $27,341 by 1994.

3.1.3.2 Employment Profile

Camp Shelby, in 1990, provided 691 full-time permanent (480 military and 211 civilian) positions. In addition, approximately 150 temporary state employees are hired during certain periods. According to the 1989 County Business Patterns, there are 13,164 state, local and federal government jobs in the five county region that comprise the Camp Shelby area (Appendix M, Section C). Therefore, Camp Shelby accounts for approximately 5 percent of the total government (state, local and federal) jobs in the area (Refer to the EIFS Forecast Model output in Appendix M, Section A and Section 3.1.4.1.1).

In addition to the full-time workforce, Camp Shelby routinely hosts units and/or individual personnel from all across the southeastern part of the United States. Some field, firing range or classroom training takes place during almost every weekend with the exception of a two to three week period in the winter. Weekend training activities could involve 600 to 5,000 troops. In addition, annual training takes place during the summer months. This involves training of some 6,000 to 8,000 troops at one time for a two week period. On the average, five two-week annual training periods are scheduled during the summer months (Appendix C). Thus, in addition to the quantifiable effect of direct employment by Camp Shelby on the local region, there are also the unquantifiable effects of bringing the training personnel and visitors into the local economy. Large numbers of personnel associated with annual training periods moving through the surrounding area provide secondary employment to various roadside businesses. These businesses include gas stations, restaurants, and convenience stores. Although the exact contribution of these training personnel and visitors to local employment is unquantifiable, it is believed to be important by the owners of such businesses.

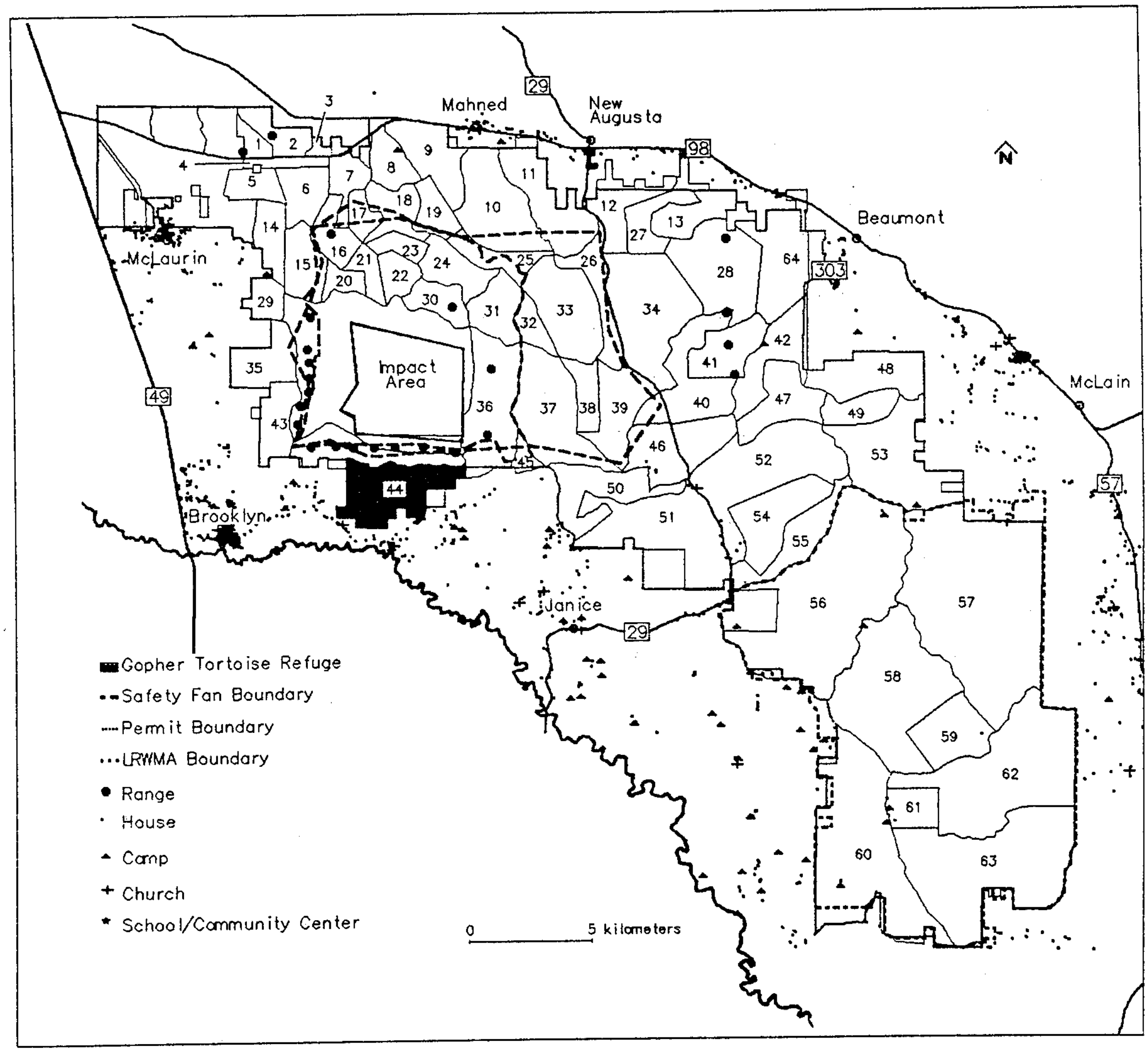

Figure 3-8A Residences, Churches and Other Sensitive Land Uses Adjacent to Camp Shelby

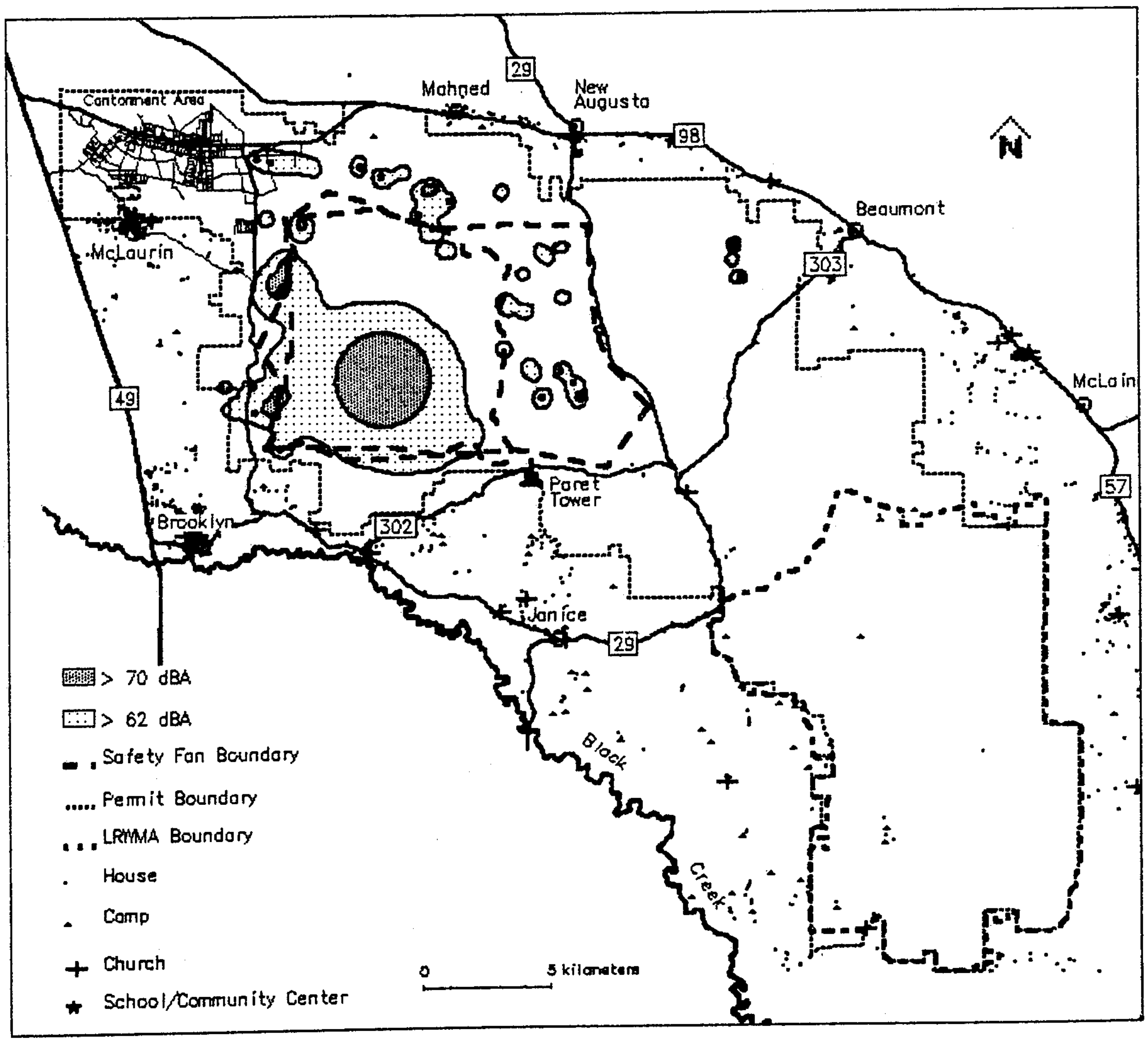

Figure 3-8B Impulse Noise Contour in Relation to Sensitive Land Uses

3.1.3.3 Historic and Cultural Setting

The main land area to be affected at Camp Shelby is the approximately 116,639 acres administered by the U.S. Forest Service. Ownership of an additional (approximately) 15,500 acres is (roughly) equally divided between the Department of Defense and the State of Mississippi. The total, approximately 134,000 acres, was considered during compilation of this portion of the EIS.

Archaeological sites at Camp Shelby may be affected by National Guard activities, such as construction and tracked and wheeled vehicle maneuvers. To date there are approximately 40 reported archeological sites within the boundaries of Camp Shelby. None of these sites is considered eligible for the National Register of Historic Places (NRHP). Based on current archeological information there are no known NRHP eligible archeological sites at Camp Shelby.

One structure, Building 6981, a World War I vintage ammunition storage facility, is listed on the National Register of Historic Places. A second structure, Building 1071, the White House, remains under consideration by the Mississippi State Historic Preservation Officer, and is considered potentially eligible at this time. Its National Register significance will be reexamined in 1995 by that office.

Currently, the Army National Guard is in full compliance with all applicable federal laws concerning cultural resources. The Mississippi State Historic Preservation Officer has agreed that no further archeological survey is required for Camp Shelby. To satisfy U.S. Forest Service permit requirements, a Phase I archaeological survey will be conducted by the National Guard prior to initiation of any construction, excavation or similar land disturbing activities at Camp Shelby on lands administered by the U.S. Forest Service. If any archeological sites are discovered at Camp Shelby which are considered eligible for listing on the National Register, they will be archaeologically tested. If testing determines these sites to be eligible for listing on the National Register, they will be formally nominated to the National Register and protected.

3.1.3.4 Current Recreation Availability

The focal points for recreation on the Black Creek Ranger District are the Black Creek Scenic River and associated corridor, Black Creek Trail, and the Black Creek Wilderness. These account for virtually all non-hunting associated recreational visits. They are known and promoted nationally in outdoor publications and in U.S. Forest Service brochures. The amount of visitors to the areas is expected to increase.

Effects of military use on recreation have been analyzed using the results of the Camp Shelby Recreational Use Survey (Appendix F). Recreational use was reported for Camp Shelby military use areas versus non-military use areas in the Camp Shelby vicinity. The survey indicates that extensive use is made of the installation by the general public. Hunting, especially for deer and turkey, is a highly valued activity and Camp Shelby training schedules

allow this use. In the survey the Black Creek Ranger District (BCRD) is divided into five zones. Zones 1, 2 and 3 are areas in which military training occurs (Appendix F, Figure 1, pg F-1 see note). Zones 4 and 5 are areas within the BCRD which are not used for military training. An analysis of the number of days in which respondents reported hunting within the various zones indicates that overall, military use zones (1, 2, 3) account for more of the hunting activity than non-military use zones (4, 5) (Table 3-9). Zone 3 includes the Leaf River Wildlife Management Area (LRWMA) and therefore can be expected to inflate the number of hunting days reported for the military use areas. Dropping Zone 3 from consideration and comparing total hunting days in Zones 1 and 2 against Zones 4 and 5 gives an almost equal number of hunting days (Table 3-8). This indicates that military use does not result in the loss of hunting use days.

Table 3-8

Participation By Zones (days)

Zones	1, 2, 3	4, 5	1, 2
Activity			
Weekday Hunting	8846	3944	4084
Weekend Hunting	7614	3691	3367
Total Hunting	16,460	7635	7451

Canoeing and camping facilities are located mainly in the non-military use zones. Comparing total camping and canoeing use days in military use zones versus non-military use zones shows that far fewer recreation seekers camp and canoe in the military use zones. Hunting use is considered to be a much less biased indicator since hunting can occur anywhere within the BCRD. It is also important to note that hunting seasons typically occur during periods of low military use. Some hunters believe that military use has positive benefits in providing trails and open areas which both hunters and game species find attractive.

Hiking, driving for pleasure and other non-consumptive recreation uses also take place on Camp Shelby. The survey specifically examined possible conflicts between recreational use and military activities; no serious conflicts were identifiable. Fifty-five percent of the survey respondents reported driving for pleasure. This activity peaks in the spring during the dogwood blooming season. The majority of this activity takes place in the Leaf River Wildlife Management Area and is not influenced by current military activities. Weekend closures of the tank safety fan limit the use of the area west of Highway 29.

Table 3-9
Participation By Zones (total days)

Zones	1, 2, 3	4, 5
Activity		
Camping	883	1233
Canoeing	167	1206

The greatest opposition voiced by most users was to the noise associated with "attack profile" flights by jet aircraft and groups of helicopters overflying a recreation area. Artillery fire noise was also considered disturbing. These were the only aspects of military use which a majority of

respondents found disturbing. This concern is also reflected in the comments received from the public during the scoping process and comment period on the Draft EIS (Section 1.1.7 and Appendix P).

The Rattlesnake Bay ATV trail has been developed within the permit area east of Highway 29 and north of FS 303. This was a cooperative effort with local ATV clubs from Hattiesburg and Wiggins, and was largely completed in 1993. Its use may require limiting use to periods when tanks aren't training. Trail development was initiated to draw unorganized usage from areas West of Highway 29. That usage resulted in safety hazards due to conflict with firing range activity. The Forest Supervisor closed the area West of Highway 29 to ATV use in 1993.

The Forest Service has recently instituted the "Limits of Acceptable Change (LAC) System for Wilderness Planning" for the Black Creek and Leaf River Wilderness areas, Black Creek Scenic River, and the Black Creek Corridor. The LAC process requires decisions concerning what kind of wilderness conditions are acceptable, then prescriptive actions to protect or achieve those conditions. With public participation, the issues and concerns for the management of these areas have been identified.

The *LAC Evaluation of the Black Creek National Forest Ranger District of Mississippi*, prepared by Dr. Kim Beason of the University of Mississippi, provides data that indicates a general approval of the current recreational availability of the BCRD. Noise associated with military training was identified as a major concern, however. In spite of military training noise, visitors participating in camping, picnicking, swimming, boating, hiking and sightseeing were very satisfied "with current opportunities offered, management areas, or facilities/services offered" (Beason 1992). Hunting in general was rated at moderately satisfactory with deer hunting being very satisfactory.

3.1.3.5 Land Use Conflicts

Military use of approximately 116,639 acres of National Forest land has caused occasional conflicts in land use, primarily relating to public access. As described in Section 2.1.2, safety requires that persons not be allowed to enter areas where significant hazards exist. In the Camp Shelby context, this has related largely to the closure for the tank main gun safety fan, which incorporates about 16,000 acres outside the dedicated impact area and buffer. Tank gunnery programs had combined, between 1986 and 1991, to cause this fan to be closed during daylight hours on most weekdays, except during deer with dog hunting season and the year-end holidays, as well as on 28 "weekends" during the spring, fall and winter. This program ended and weekday conflict was removed as of October, 1991.

The primary adverse effect has been on recreational access, as discussed above, and access for timber harvest (Section 3.1.2.3). The actual timing of the weekend closures has been (more than 80 percent, for 1990-91) from 2 p.m. on Friday to 2 a.m. on Sunday. Friday afternoon and evening and Saturday have thus been the times of actual access restriction. On only 5 dates in 1990-91 was any Sunday usage actually required, and on these days the

closure times extended from 2 a.m. to between 9:30 a.m. and 11 a.m. While sometimes bothersome to recreation seekers, this closure has likely had positive effects on gopher tortoise survival (see Section 3.1.2.5).

The potential for possible conflicts between ATV users and military use exists on and around the Rattlesnake Bay all terrain vehicle (ATV) trail. There are no conflicts in land use within the Leaf River Wildlife Management Area except occasionally during annual training.

Leasing of National Forest land and other locations where rights for mineral exploration and extraction are held by private parties occurs within the proposed Special Use Permit area. This potential land use conflict is discussed in Section 3.1.4.2.

3.1.3.6 Governmental Entities

No land acquisitions or boundary changes which would adversely affect existing units of local government have taken place through Camp Shelby military activities. No acquisition of private property through condemnation is proposed.

3.1.4 Economic Environment

3.1.4.1 Regional Economy

3.1.4.1.1 Present Status

The Economic Impact Forecast System (EIFS) was utilized to determine the effect of approximately 700 full-time permanent employees on the economy of a five county area (Figure 2-11). This was determined by the use of forecast models which estimate socioeconomic impacts resulting from major changes in activity at a military installation. These impacts were estimated on five economic variables: (1) business volume, (2) income, (3) employment, (4) government expenditures, and (5) housing demand. Information relevant to changes in employment, average income of full-time permanent employees (both civilian and military), and the amount contributed toward local services and supplies was used as input to the forecast model. The amount spent annually for local services and supplies totals $16,032,000. The output was the Standard EIFS Model Forecast (Refer to Appendix M, Section A).

Results of EIFS analysis show that Camp Shelby has a positive effect on the economy of this five county region (Table 3-10). Its clear and measurable contribution to local sales volume was indicated at 3.68 percent, contribution to employment was 2.45 percent, and contribution to income was shown as 1.72 percent.

3.1.4.1.2 Trends

Employment in the Non-Durable Goods category, which includes forest products, continues to decline as a proportion of the regional economy. Employment in the forest products industry declined from 1969 to 1983, and is also projected to decline consistently over the years from 1990 to 2035 (OBERS projections, Appendix M, Section D). State and local employment is projected to stay fairly constant. Since Camp Shelby is a stable source of employment in the region, under the current level of activities it will become relatively more important to the regional economy.

Table 3-10 Standard EIFS Model Forecast Results

(Enter decreases as negative numbers) If entering total expenditures, enter 1; local expenditures, 2 : 2	
Change in expenditures for local services and supplies:	$16,032,000
Change in civilian employment:	211
Average income of affected civilian personnel:	$19,500
Percent expected to relocate:	0
Change in military employment:	480
Average income of military living on-post:	$22,000
Percent of military living on-post:	0
Standard EIFS Model Forecast	
Export multiplier:	2.1057
Sales volume:	Direct: $23,670,000 Induced: $26,172,000 Total: $49,842,000 (3.679%)
Employment:	Direct: 249 Total: 1,216 (2.454%)
Income:	Direct: $3,301,000 Total (place of work): $21,626,000 Total (place of residence): $21,626,000 (1.716%)

3.1.4.2 Mineral Exploration and Extraction

There is a potential for the training activities at Camp Shelby to conflict with access to subsurface minerals. As of March 1992, there were 32 active mineral leases under Interior Department regulations covering National Forest lands within the Camp Shelby permit area. These leases occupy 31,378 acres of National Forest land. Two of these leases, totalling 3,963 acres, are currently in active production for natural gas and oil. A lease for 621 acres for exploration of sulfur exists, and wells were drilled in 1991, but no determination of economic viability has been made.

Leasing of National Forest land for mineral exploration and extraction is not controlled by the National Guard, but rather by the Forest Service and Bureau of Land Management, Department of the Interior. Military Use Special Stipulations for the Camp Shelby Training Area are incorporated with standard leases for oil and gas. These stipulations state that the lessee shall not conduct exploratory activities on the leased lands during periods when the National Guard has been permitted the use of the area. However, provision is made for exploratory activities during these periods provided the National Guard gives written permission to the lessee. Periods of National Guard use are subject to 90 days prior public notice. Appendix T consists of a sample lease and the full text of the Military Use Special Stipulations.

There are 3,691 acres of National Forest lands in the Camp Shelby area whose mineral rights are classified as "reserved" or "outstanding" in private ownership (see Figure 2-12). A reservation occurs when the individual or business selling the land to the Federal Government retains an interest in ownership of the subsurface. They may reserve all or part of this interest and may specify which minerals they wish to retain ownership of. Reservations by the seller are governed by rules and regulations set forth by the Secretary of Agriculture, which are part of the deed to the United States. The rules and regulations have changed with time and requirements vary depending on the year the deed was executed.

Minerals are considered "outstanding in the third party" when they are severed from the surface prior to the current selling of the land. The minerals belong to someone other than the current seller or buyer. Rights of the mineral owner are usually found in the deed and may be very specific. Outstanding rights are not subject to the Secretary of Agriculture's rules and regulations for protection of the surface. At this time, there are no active leases which are based on these privately held rights, so no current conflicts are known.

Mineral rights below lands owned by the Department of Defense and the State of Mississippi may also, for the same reasons discussed above, be either reserved or outstanding where they are not owned by the surface owner. The number of acres which fall in these categories is not known at this time.

3.1.4.3 Forest Products

The economic effects on the forest products industry from the current use of Camp Shelby are difficult to quantify. The removal of the tank maneuver areas from active timber management has effectively removed from the market up to roughly 3 million board feet (MMBF) of pine timber annually, as discussed in Section 3.1.2.3. Because of the weekday tank fan closures west of Highway 29, an additional 3-4 MMBF of pine was deferred annually between 1985 and 1991 to other portions of the Black Creek Ranger District. This area was opened for normal National Forest activities on October 1, 1991.

Other military activities have had varying effects on the forest products industry. Logging contractors have at times had to stop harvest operations to accommodate maneuver training. All contractors operating within the permit area are routinely advised to coordinate their harvest plans with Camp Shelby Range Control, especially during the summer AT periods. Some trees west of Highway 29 have been found to be "contaminated" with bullets. This is considered an extremely dangerous situation by the harvest crews and mills involved, and the price obtained for this timber is less than normal market value. Some potential buyers decline to submit bids for it at any price.

As discussed in Section 3.1.2.3, removal of large acreages from the pine timber management base in the Camp Shelby economic area may have had adverse subtle impacts on both the local forest products industry and on woods workers (harvest crews). Although within the five county area the acreage involved is relatively insignificant, reduced volumes in an area of already tight markets increases competition and prices for the remaining timber. This is one factor in a reduced market area pine timber base which, coupled with improved mill efficiencies and increased production, has contributed to a continually increasing expansion of the purchase area for any given mill to provide it with a continuous supply of logs. Local logging contractors have felt some impacts due to the increased haul distance and travel time from their home base of operations. This is frequently done with little or no additional compensation from the mills. Thus, net profits to independent contractors are effectively reduced as expenses are increased. Conversely, the holders of stumpage may enjoy increased prices and competition for their products - a classic supply versus demand example.

3.1.5 Noise

Current training activities, facilities and military land uses that cause noise at Camp Shelby are described in Sections 2.1.1 and 2.3.2 of this document. Actual usage is summarized in Appendix C, part 8, and the consequences of current usage on the environment are summarized in Table 3-1a. The results indicate that 11 of the 22 uses or activities have the potential for adverse consequences with respect to noise. These are b) convoy training, d) aviation training, e) airborne training, i) artillery training, j) infantry Army Training and Evaluation Program (ARTEP) training, k) engineer ARTEP training, l) mortar training, q) Air Force tactical air training, r) tracked vehicle maneuver and ARTEP training, u) tank gunnery training and v) small arms training.

All general noise (measured on the A-weighted scale, see Appendix I) caused by non-firing training, such as vehicle traffic, largely affects only areas within the Camp Shelby permit area and is considered here to have negligible (0) or insignificant (-) impact. Impulse noise (measured on the C-weighted scale) associated with artillery and tank gunnery training is potentially significant, based on Army planning criteria, only within the boundaries of Camp Shelby. As discussed in Section 2.3.2, three nearby areas experience higher than desirable impulse noise levels, although standard calculations do not show these levels to be outside planning limits as of 1993. Operational noise associated with Air Force tactical air training also has the potential to be significant (--) (Table 3-1) and is addressed below.

3.1.5.1 Impulse (Weapons) Noise

One recent evaluation of noise producing activities at Camp Shelby, and including field measurements as well as total energy calculations, was conducted by the Army Environmental Hygiene Agency in January of 1988. This information is discussed at length in Section 4.3.3 of the Training Facilities Environmental Impact Statement for Camp Shelby (Weatherford McDade Ltd., 1991). An analysis of 1987-89 firing data prepared for the Draft EIS produced similar results (Appendix I). Summarized, the results of this previous evaluation indicate that all A- and C-weighted impulse noise contours in the zone III range at Camp Shelby are within the installation boundaries. The zone is closely associated with the impact area and adjacent artillery firing points. A-weighted noise contours in the zone I and II ranges also fall within the installation boundaries. The zone II contour for C-weighted noise (in 1988) was within the installation boundary with the exception of 3 locations. Two of these locations are low-population areas; however, the third location includes several residences along Paret Tower Road (FS302) between Brooklyn and Paret Tower (see Figures 3-8A and B). A total of 10 residences fell within Zone II based on Geographic Information System analysis, and five more were within 600 feet of that boundary, and probably receive only slightly lower noise levels. It may be assumed that firing noise is audible at some times at most of the 1,100 residences located in closest proximity to Camp Shelby (see Section 3.1.3). Zone II and III noise contours do not reach the Black Creek Wilderness, Black Creek Scenic River, or Leaf Wilderness which are located south and east of the installation under normal atmospheric conditions. It is reasonable, however, to assume that firing noise may, indeed, be *audible* in the wilderness under conditions favorable to sound reflection.

As discussed in Section 2.3.2.1, however, each of the previous studies was made at a time when the "M60A3" program was active. This program involved daytime firing from Monday through Friday for approximately 20 weeks of the year outside the summer AT period. The number of rounds expended of 105mm tank main gun ammunition was much greater for that multi-year period than has been the case since October 1991. A significant decrease in the use of this ammunition has resulted in recalculation, in October 1993, of annual noise levels based on present ammunition usage levels. This revised calculation, presented in Figure 2-3A, more accurately represents the results of total ammunition expenditures in the past two years. The populated areas described above are still those most likely to experience annoyance as a result of heavy weapons usage, but the magnitude of this noise has decreased somewhat since 1991.

3.1.5.2 Aircraft Noise

There are two broad categories of contributors to aircraft noise at Camp Shelby, Army guard helicopters and Air Guard jet aircraft. Army National Guard aviation use of the Camp Shelby military reservation is a coordinated and scheduled activity through the Camp Shelby Range Control. Army Guard Aviation training activities are administered through the use of a "restricted airspace" identified as R-4401. Camp Shelby has control only of scheduled aircraft conducting training inside the restricted airspace, or when utilizing any one of the three Nap of the Earth (NOE)/night vision goggle lanes located outside of the R-4401, but inside the Camp Shelby permit boundaries. Army Guard aviators training at Camp Shelby are briefed to maintain 1,000 feet minimum altitude when within 1,000 meters laterally of the Black Creek Scenic River to reduce noise pollution and to prohibit flight below 2000 feet over the Black Creek Wilderness and the Leaf Wilderness, which are located to the south and east of the military reservation, respectively. Camp Shelby has no information about or control over civilian or military aircraft flying *outside* R-4401.

Army National Guard Helicopters: In addition to the noise of helicopter operations associated with travel to and from the training areas, some noise is generated through conduct of Nap-of-the-Earth (NOE) training activities. This training is conducted at very low altitude (at or below treetop level) and very slow speeds along three specified routes established for many years in the southeast part of the permit area. There was a fourth route which was abandoned when the Black Creek Wilderness was established, because it was believed to pass too close to that area. These routes (see Figure 2-3A) are selected to intentionally avoid inhabited areas, lights, roads and other distracting features. Noise model calculations indicate that, because this NOE activity is relatively infrequent, the "normally incompatible" zone forms a band about 200 feet to each side of the route. There are no residences within this zone. As with tank traffic, however (see Section 3.1.5.3), there is a wider area within which persons will be aware of the flights, and may be annoyed by them. This distance, which varies considerably with different wind and weather conditions, is about a quarter of a mile. There are four residences within this distance from the nap of the earth (NOE) routes.

Jet Aircraft Activities: Air National Guard training activities occurring adjacent to and outside the R-4401 are scheduled by the Air National Guard, Gulfport, MS. These high-performance jet aircraft conduct simulated air to air combat training in the De Soto Military Operations Area (MOA). Use of the De Soto MOA is scheduled by the Air Guard through the FAA. Military Aircraft training in the MOA are regulated by the FAA not to fly any lower than 500 feet above ground level (AGL). Air National Guard aircraft utilize the Camp Shelby Air to Ground ranges approximately 250 days a year (Appendix C, Section 6), conduct approximately 2,000 to 2,800 operational flights to the Camp Shelby ranges, and make roughly 20,000 bombing or gunnery "passes" per year. This range use is scheduled and approved through Camp Shelby Range Control. These aircraft can originate from any air base in the United States, and are under the control of the FAA until they enter R-4401 to train on these ranges. The Air National Guard administers control of these aircraft when entering and exiting the Camp Shelby ranges by the use of designated "corridors" in an effort to minimize noise pollution over populated areas outside R-4401. Within R-4401, however, a

preliminary study by the National Guard Bureau in 1991 and 1992 (see Figure 2-3B) indicated that the noise generated by these high-performance aircraft while orbiting the target area may result in "normally incompatible" levels (i.e., Zone II) in one populated area. This is the area east of Brooklyn along Paret Tower Road (FS 302) within a mile of Paret Tower, and extending to Highway 29 in the Cypress Creek area. It must be noted that this is the same area which was within the Zone II contour for impulse (weapons) noise at this same time, thus its effects on occupants of these residences may be assumed to be more annoying than if only one source were significant. Changes in flight paths, initiated in June of 1993, resulted in decreases in jet aircraft noise in this area. Section 3.2.4 and Figures 2-3B and 3-19 illustrate the effect of this newly-implemented mitigation measure.

3.1.5.3 Vehicle Noise

As discussed in Section 2.3.2.2, the magnitude of this noise is greatest at the times when the largest numbers of vehicles are concentrated at Camp Shelby, i.e., during the (summer) Annual Training periods, from about May 1 through August 15. Other locally large concentrations may be expected on weekends, from Friday afternoon through early Sunday morning, on about 14 weekends at other times of the year. Major contributors to this noise are vehicles such as tanks, trucks and armored personnel carriers. Travel from the cantonment area and motor pools to and from the training areas causes the equivalent of "traffic noise" along these fixed routes. Calculations based on accepted noise impact models show that this vehicle traffic results in "normally incompatible" zones, i.e., Zone II, (see Appendix I for a discussion of zones) in a strip about 35 feet wide on each side of the trail. This is similar to the effect of highway noise; the strips adjacent to the pavement should not be used for sensitive human uses. Beyond the "incompatible" level, there may be identified an "annoyance" distance, within which persons hear the traffic and may react with negative psychological or emotional reactions even though the noise levels are not damaging to hearing. This zone is less precisely calculable, and depends greatly on weather, vegetation and time of day, but extends approximately 500 to 600 feet from the trail. The most-heavily traveled routes (tank trails) are shown in Fig. 2-3A. Geographic Information System (GIS) analysis indicated that there are no residences within this "annoyance" zone. As with weapons noise, however, concentrations of vehicles may be *audible*, or even annoying, at greater distances depending on atmospheric conditions, wind direction, and time of day.

3.1.5.4 Effects of Noise on Wildlife

Noise on Camp Shelby is generated from a variety of sources, including vehicles, aircraft, weapons, maintenance activities, and forestry operations. Certain frequencies and types of noise are more disturbing to wildlife than others, and how consistent the noise pattern is also appears to be a major factor. For example, a review of the many published studies suggests that among all types of aircraft studied, helicopter noise may be more disruptive to birds and other wildlife than fixed-wing or jet aircraft (Klein, 1973; White and Sherrod, 1973; Fleischner and Weisburg, 1986; Ward et al., 1986; Awbrey and Bowles, 1990). The unique sounds associated with helicopter flight, combined with the very low altitudes, seems to bother wildlife more than normal high flying jet aircraft. Helicopters hovering at or below

the level of the tree tops could have negative impacts to nesting birds. Helicopter down-wash (the wind generated from the rotors) and noise could frighten an adult bird incubating eggs to temporarily abandon its nest, and young birds might be blown off the nest or frightened into jumping prematurely. Because of the many variables and uncertainties, it is not possible to quantify mortality or a reduction in fitness attributed to disturbance from low-flying helicopters, but the potential of negative impacts to breeding birds is acknowledged.

The long-term effects of military or civilian noise on the wildlife at Camp Shelby and adjacent areas are still largely unknown. The majority of the training areas are open to sport hunters, fur-trappers, and fisherman for much of the year with no apparent shortage of game animals (Weatherford McDade LTD, 1991) reported. Many animals become habituated to repetitious or consistent noise patterns within a relatively short period (Edge and Marcum, 1985; Krzysik, 1987 and 1989; Lee, 1981), that is, the animals simply "get used" to the noises. Wildlife in the impact area on Camp Shelby have probably been exposed to the greatest level of noise disturbance, and yet white-tailed deer have been regularly observed feeding there during firing exercises (LTC L. Rayburn and MAJ E. Shows, personal communication, 1991). Deer are often in very close proximity to exploding artillery rounds and commonly look up towards the noise for a few seconds and then resume feeding. While these observations concern just one species out of many, it does provide some Camp Shelby-specific evidence of habituation to military noise. Nevertheless, the effects of human, vehicular, and aircraft noise can be difficult because it is often unclear whether animals are responding to the sight of the "human", the "vehicle", or the sound generated from them. Therefore, in the following discussion, "noise" refers not only to the sound, but also its source, and in many cases no attempt has been made to differentiate the impacts from each.

Sound plays a significant role in the reproductive behavior and success of many amphibian species (e.g., anurans), but appears to be of lesser importance to reptiles and even lesser still to most fish (Manci et al., 1988). Brattstrom and Bondello (1983) found that recorded motorcycle sounds elicited emergence of Couch's spadefoot toads (*Scaphiopus couchi*) from their burrows. This species inhabits the arid southwestern United States, and a potentially detrimental impact on a population could occur if an emergence occurred during a dry period. Bondello (1976) also found that for the desert iguana (*Diposaurus dorsalis*), off-road vehicular noise of 114 decibels (dB) for as little as one hour resulted in a shift of the hearing threshold, with some permanent hearing loss being reported. In a population of the neotropical treefrogs (*Eleutherodactylus coqui*), calling behavior was avoided when sound levels were introduced which barely exceeded that found on the forest floor (Zelick and Narins, 1980). Salmonid (trout, salmon) fish eggs, repeatedly exposed to both real and simulated sonic booms, did not cause any increase in egg mortality (Rucker, 1973). Schwarz and Greer (1984) found that the salt water pacific herring (*Clupea harengus pallasi*) exhibited short duration "startle" responses to certain sound stimuli. Similarly, Rucker (1973) documented that juvenile rainbow trout (*Salmo gardineri* (*Oncorhynchus mykiss*)) exhibited only a very slight and brief behavioral reaction to sonic booms. In terms of noise impacts, very little research regarding the reactions of freshwater fish to atmospheric noise currently exists.

Honey bees (*Apis mellifera*) have also been reported to have ceased movements for as long as twenty minutes in response to frequencies between 200 and 2,000 Hz and with intensities ranging from 107-119 dB, and *did not* appear to habituate to the noises (Frings and Little, 1957; Little, 1959). Again, there is relatively little applicable data in the literature concerning the responses of invertebrates to noise.

For raptors, whose responses have been most thoroughly studied, and most likely all birds, the nest building and egg laying phases are probably the periods in which they are most sensitive to noise disturbance (Grier and Fyfe, 1987). Disturbance to nesting birds has the potential to result in nest abandonment, inadequately incubated eggs resulting in death of the embryo, or hatchlings being startled and prematurely jumping from their nest. Scientists attempting to quantify responses of wildlife (often focusing on raptors or waterfowl) to noise disturbance during military, construction, and logging activities in other areas of the country have often reported inconsistent or inconclusive results. Anderson (1984) reported that military activities at Fort Carson, Colorado, have significantly decreased nesting success in some nesting raptors, but went on to report that "Military disturbance did not seem to play an important role in determining winter raptor densities..." The destruction of an entire cohort (group) of sooty terns (*Sterna fasca*) in Florida was attributed to frequent sonic booms produced by jet aircraft flying over a colony (Austin et al., 1970). Ames (1964) found osprey nesting in remote sites that were suddenly exposed to human disturbance fledged fewer young than those nesting in sites subjected to persistent human (recreational) disturbance. Fleischner and Weisberg (1986) speculated that bald eagles occupying suitable habitat near Bellingham International Airport would be negatively impacted by aircraft noise if the jets elicited a flight response from the eagles more frequently than was observed. Other researchers have also reported human disturbance as being a major cause of raptor nest failure (Boeker and Ray, 1971; Verbeek, 1982; Grier and Fyfe, 1987). Disturbance to nesting raptors from biologists, with measurable adverse impacts, has also been documented (Grier, 1969; Fyfe and Olendorff, 1976; Nelson, 1982). Minor human disturbances may cause long-term effects on lifetime reproductive success of birds by increasing energy and time expenditure in non-reproductive activities and by reducing condition of nestlings (Fernandez, 1993).

Mule deer (*Odocoileus hemionus*) and coyotes (*Canis latrans*) at Pinon Canyon Maneuver Site in southeastern Colorado most frequently responded to military activities by increasing the size or otherwise shifting the center of their home ranges temporarily (Stephenson, 1989; Geese et al., 1992). Also, differences in deer mortality and productivity in maneuver and non-maneuver areas, if any, were not directly attributed to military activities (Stephenson, 1989). Noises associated with sport hunting and logging activities have also produced similar deviations in the movement patterns and home ranges of white-tailed deer (Pilcher and Wampler, 1982; Root et al., 1988) and elk (Hershey and Legee, 1982; Edge et al., 1985; Edge and Marcum, 1985). Klein (1973) observed that grizzly bear (*Ursus arctos*) in northern regions were more disturbed by aircraft noise than were wolves or ungulates (deer, moose, etc.). The black bear (*Ursus americanus*) in Mississippi could also be equally disturbed by low flying aircraft. However, differing behavioral tendencies for the two species and a lack of similar research in the longleaf pine region would be inconclusive at best.

It is common for relatively mobile animals to respond to noise by running or flying away from the source(s) to another area. This type of response, however, does have the potential to produce some negative consequences. Wildlife species in the polar regions rely heavily on internally stored food reserves to help carry them through the long harsh winters, and energy conservation may be the single most critical factor to their survival. Frequent disturbance to animals in the polar regions may potentially be more detrimental than for animals in a stand of Mississippi longleaf pine, but the same principles apply to both. A disturbance occurring in any region may cause an individual to expend energy towards moving away from the source of the noise. For territorial species (e.g., carnivores), this energy loss may be compounded if the displacement results in increased *intra*specific and *inter*specific conflicts. That is, conflicts arise as resident animals and the displaced animals meet. The net effect is a reduction in the energy reserves of not only the displaced but the resident animals as well. This energy reduction potentially could determine whether the animal will survive until spring or its ability to breed successfully.

Whether a sudden increase in animal numbers within an area exceeds its carrying capacity cannot be known with certainty in advance, but the assumption that all habitats are always at carrying capacity is not biologically substantiated. The ability of an area to support individuals of a certain species can change in a few minutes (as the result of fire, a tree being cut, or an oil spill for example), and most always changes seasonally. The quality and quantity of food and cover, water, season of the year, behavioral tendencies, and reproductive requirements are just some of the factors used in assessing an areas' carrying capacity for a species. It is clear that exceeding the carrying capacity for prolonged periods can be especially detrimental to fragile ecosystems. In the well publicized case of the Kaibab Plateau in northern Arizona, the mule deer population greatly exceeded the ranges carrying capacity for many years, resulting in severe damage to the range. Following several herd reduction efforts, the range began to slowly rebound, but scars of the range devastation could still be observed decades later (Russo, 1964).

Raptor nest failure at Fort Sill, Oklahoma, has on at least one occasion been directly attributed to military activities, but observations over a seven year period suggest this result is the exception rather than the norm (Sam Orr, personal communication, 1991). One of the largest northern harrier (*Circus cyaneus*) winter roosts was documented in the tall grass prairie of the west range on Fort Sill on February 7, 1988. A minimum of 1,053 harriers were counted leaving the 1,300 acre roost area. Censused on an annual basis by Fort Sill natural resource personnel and community volunteers since 1985 (S. Orr, personal communication, 1992), this study area is located within the safety zone surrounding the South Arbuckle Range impact area. Several other researchers (Jackson et al., 1977) on a U.S. Navy bombing range in Noxubee County, Mississippi observed a northern harrier (marsh hawk) as jet aircraft flew as close as 1,500 feet (aircraft noise levels of 80-87 dB) from the bird, dropping 25 pound bombs. They concluded the harrier was "opportunistically" hunting small mammals and birds flushed from cover by the explosions. The noise associated with low level jets on nesting peregrine falcons (*Falco peregrinus*) in Arizona, while noticeably alarming the birds, did not appear to limit peregrine productivity (Ellis, 1981). During a U.S. Air Force supersonic acceptance test flight of F-111 jets south of Fort Worth, Texas,

songbirds became silent 4-8 seconds prior to sonic booms (Higgins, 1974). Higgins (1974) observed that during each sonic boom, the birds uttered "raucous discordant cries" for a few seconds, then returned to their normal singing patterns within ten seconds after the audible boom.

Lynch and Speake (1978) concluded that neither real nor simulated sonic booms produced adverse effects on nesting behavior or productivity in the eastern wild turkey (*Meleagris gallopavo silvestris*). Holthuijzen (1989) asserted that construction activities (including blasting), in general, had no detectable adverse effects on nesting prairie falcons (*Falco mexicanus*) in the Swan Falls area of Idaho. Data collected from field studies on the Fort Sill Military Reservation indicate no detectable differences between nesting frequency or success within the impact, training, and cantonment areas. The data also indicate that inclement weather contributed more to nest failures than noise or other types of disturbance. As an example, in 1989 an adult red-tailed hawk remained on her nest (#124, Fort Sill Fish and Wildlife Branch database) as 105mm and 155mm howitzers were being fired 50 feet from the base of the tree (Sam Orr, personal communication, 1991). Data from the Fort Sill Fish and Wildlife Database indicate that in 1988 a pair of red-tailed hawks successfully fledged two young. This nest was directly in front of a small arms firing range, and was bordered on the west side by a major impact area. The trunk of the nest tree was riddled with bullet holes to a height of about 18 feet, and the nest itself was approximately 30 feet off the ground. In 1990 this same nest was occupied by a great-horned owl. Whether the nest failed or was successful could not be determined.

Aside from differing ecological communities, it is important to note two other differences pertaining to land use between Fort Sill and Camp Shelby. First, Fort Sill is the Army's' primary field artillery training school, and the resident wildlife on nearly every part of the 95,000 acre installation (there are four major impact areas) have had many years to habituate to these unique types of disturbances (noises). Secondly, no live timber removal is permitted on Fort Sill. Other variables such as recreational use, precipitation, topography, soils, vehicles used, and training intensity and frequency are so site-specific that extrapolation of the specific conclusions to the wildlife inhabiting the Camp Shelby area would be largely speculative.

It is evident that in areas of similar habitat and land use that species can respond to the same disturbance differently, and that the maturity and current reproductive stage of each individual are likely major factors in determining the direction and magnitude of that response. In other words, it is quite possible that some individuals and species do not have the ability to habituate to many disturbances. Thus, while some wildlife species on Camp Shelby have undoubtedly become habituated to military noises over the past several decades, the behavioral and (equally important) physiological effects on many of the wildlife species cannot be accurately assessed without additional region-specific research.

3.1.6 Leaf River Wildlife Management Area (LRWMA)

Although wildlife populations in the LRWMA are being managed by the Mississippi Department of Wildlife, Fisheries, and Parks, habitat management is under the broader management operations of the U.S. Forest Service (USFS). The USFS has and will continue to harvest and manage a variety of timber species in the LRWMA. However, the proposed expansion of training activity into the LRWMA caused public concern regarding the ecological and management status of the area. A segment of public opinion described the LRWMA as being a unique area, some referred to the LRWMA as a wilderness area, while others felt that the LRWMA was being managed differently than the rest of the De Soto National Forest.

It is quite evident that the LRWMA is not a wilderness (i.e., undisturbed) area (The LRWMA should not be confused with the Leaf Wilderness, a much smaller area four miles east of the LRWMA near Leaf, Mississippi). The pine forests have been drastically altered and the area no longer supports some of the species that were found there during Claiborne's time (see Section 2.4.6.4). By the 1930s, stands of virgin longleaf pine were very difficult to find in southern Mississippi because most areas had been timbered.

The establishment of the Leaf River Development Project and the wildlife management activities of the Mississippi Game and Fish Commission of the late 1930s were done in conjunction with USFS timber management plans. This Memorandum of Understanding (MOU) is still in effect today. Wildlife management projects of the Mississippi Department of Wildlife, Fisheries, and Parks in the LRWMA are coordinated with timber management and require approval by the USFS.

<u>Forest Composition and Age</u>: The LRWMA is managed as part of the Black Creek Ranger District (BCRD) and contains 39 management compartments. Each compartment is a small watershed subdivided into stands for which specific management information is retained by USFS. This information base developed by USFS makes it possible to compare management activity in the LRWMA to other areas in the De Soto National Forest, particularly activities in the Black Creek Ranger District (BCRD).

Forest management practices and cover types were assessed by examining forest composition, age distribution, and stand condition between the LRWMA and the remainder of the BCRD for certain species and species groups. Data were provided by the USFS from their timber management data base in Wiggins, Mississippi. Twenty-nine management compartments (33,667 acres) were selected from the LRWMA for the comparisons. Only compartments that were completely within the boundaries of the LRWMA were chosen. Those that extended beyond the LRWMA boundary were omitted. All remaining compartments were included for the figures developed for the BCRD (182,769 acres).

The number of tree species found on both the LRWMA and BCRD are rather extensive. To allow meaningful comparisons between the two areas, species that are dominant and/or

economically important are featured. In some cases, species were grouped together to allow those that may not meet the above criteria to be represented.

Forest Composition: Forest composition was calculated for both the LRWMA and BCRD for five species and species associations. The groups consisted of pines mixed with hardwoods, loblolly pine, slash pine, longleaf pine, and mixed hardwoods. Figure 3-9 shows that longleaf pine dominates both the LRWMA and BCRD, comprising 55.4 percent in the former and 44.1 percent in the latter. Loblolly pine comprises only 7.6 percent of the LRWMA but is greater than twice that amount in the BCRD (18.3 %). Slash pine, pine-hardwood mix, and mixed hardwoods were very similar in the two areas. The forest cover types of the LRWMA are typical of the BCRD.

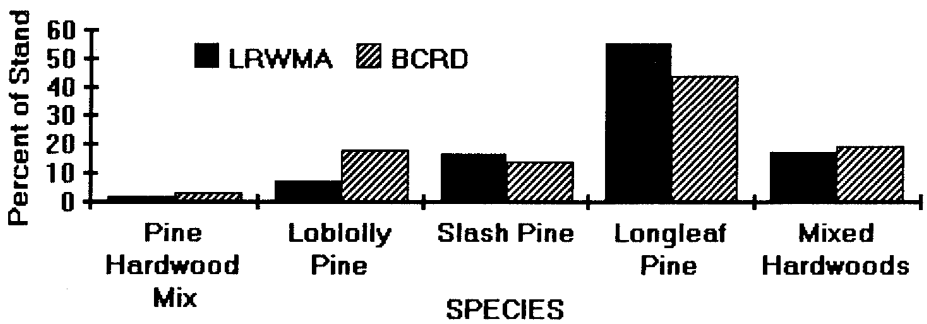

Figure 3-9. Forest Composition as a Percentage of Total Stand in the Leaf River Wildlife Management Area and Black Creek Ranger District, De Soto National Forest, Mississippi.

Stand Condition: Stand condition was calculated for both the LRWMA and BCRD for longleaf pine and mixed hardwoods. Stand condition reflects the management classification of a stand and can fall into several categories. A simplification of the USFS classification system was achieved by grouping stands into three categories. These included stands in regeneration (regeneration and seed/sapling stages), stands classified as pole timber, and stands classified as saw timber.

Stand condition for longleaf pine was assessed because this species is the most economically important in both the LRWMA and BCRD and stand condition for this species reflects management activity. Longleaf pine in regeneration in both areas is very similar, currently about 22 percent (Figure 3-10). A similar relationship exists for stands classified as saw timber and pole timber. There is slightly less longleaf pine classified as pole timber in the LRWMA (5.9%) than the BCRD (10.6%) as a whole. The LRWMA has 72 percent of its longleaf pine stands classified as saw timber and the BCRD 66.8 percent. These figures indicate that timber management activities (harvesting and reforestation) in the LRWMA and BCRD are very similar. However, this result may surprise the public because some

comments depicted the LRWMA as being managed differently by USFS than other areas in the De Soto National Forest.

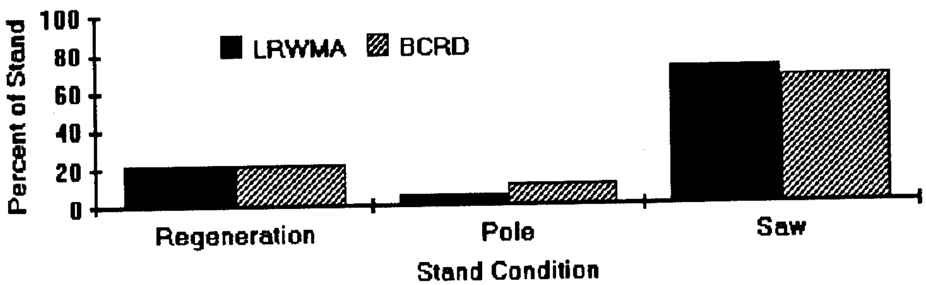

Figure 3-10 Stand Condition for Longleaf Pine in the Leaf River Wildlife Management Area and Black Creek Ranger District, De Soto National Forest, Mississippi.

Hardwood stand condition is very similar in the LRWMA and BCRD (Figure 3-11). The LRWMA currently has 14.7 percent of its hardwoods in the pole stage while hardwood stands in the BCRD are 22.7 percent pole timber. Saw timber dominates hardwood stand condition in both the LRWMA (85.3 percent) and the BCRD (74.6 percent). Again, these figures indicate the similarity in forest management occurring in both areas.

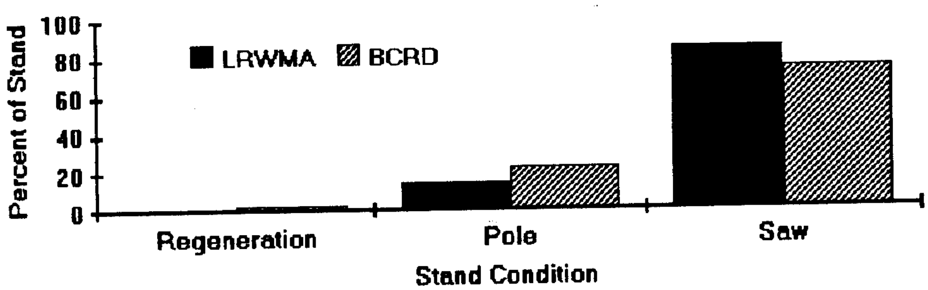

Figure 3-11 Stand Condition for Hardwoods in the Leaf River Wildlife Management Area and Black Creek Ranger District, De Soto National Forest, Mississippi.

Age Class Distributions: Examination of the age distribution of different timber species in the LRWMA and BCRD can provide further insight into forest management. USFS age distribution data for single species and species groups is graphically presented. These figures show data similar to that previously presented in the condition class figures. The distribution of age classes, not the comparison of individual age classes, reveals information about the management of both areas.

For all species combined, both the LRWMA and BCRD show very similar age patterns (Figure 3-12). Comparable results can be observed for all pine species combined (Figure 3-13), hardwood species (Figure 3-14), longleaf pine (Figure 3-15), loblolly pine (Figure 3-16), slash pine (Figure 3-17), and mixed pines/hardwoods (Figure 3-18).

The consistency in the distributional patterns indicates that very similar management practices have been occurring throughout the BCRD for quite some time. If major differences in age distribution patterns were detected between the LRWMA and the rest of the BCRD then one could assume that different management programs had been established and implemented, however, this is not the case.

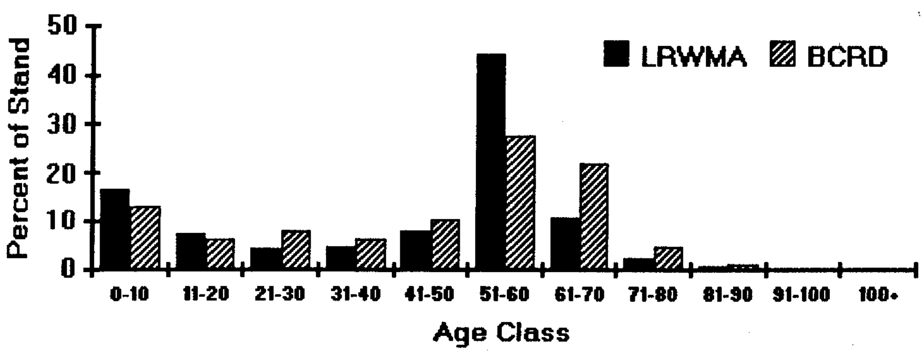

Figure 3-12 Age Distribution of All Tree Species in the Leaf River Wildlife Mangement Area and Black Creek Ranger District, De Soto National Forest, Mississippi.

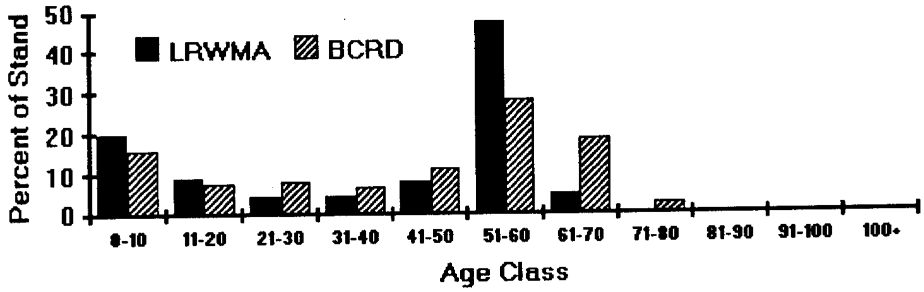

Figure 3-13 Age Distribution of All Pines in the Leaf River Wildlife Mangement Area and Black Creek Ranger District, De Soto National Forest, Mississippi.

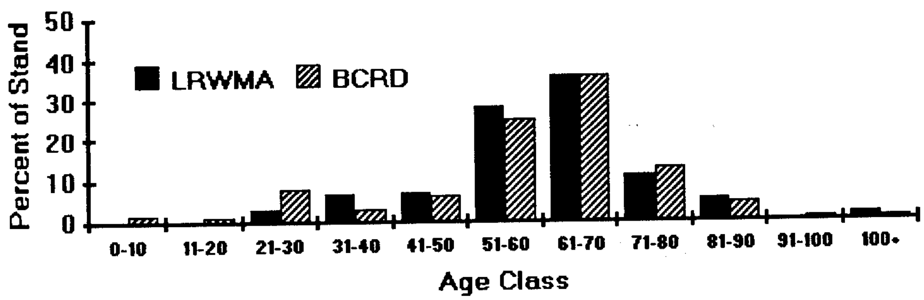

Figure 3-14 Age Distribution of all Hardwoods in the Leaf River Wildlife Mangement Area and Black Creek Ranger District, De Soto National Forest, Mississippi.

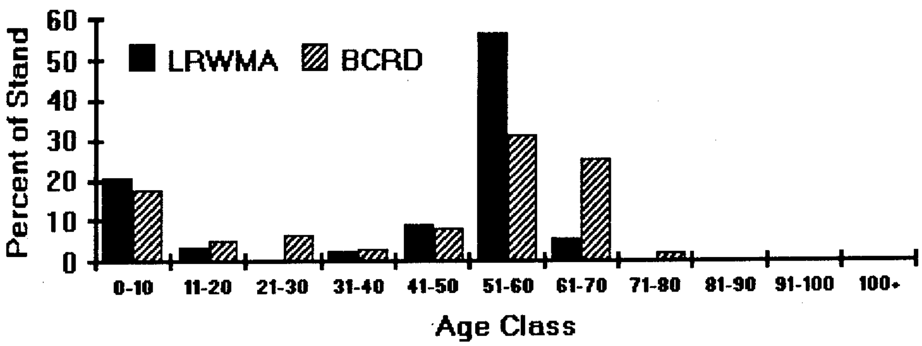

Figure 3-15 Age Class Distribution for Longleaf Pine in the Leaf River Wildlife Management Area and Black Creek Ranger District, De Soto National Forest, Mississippi.

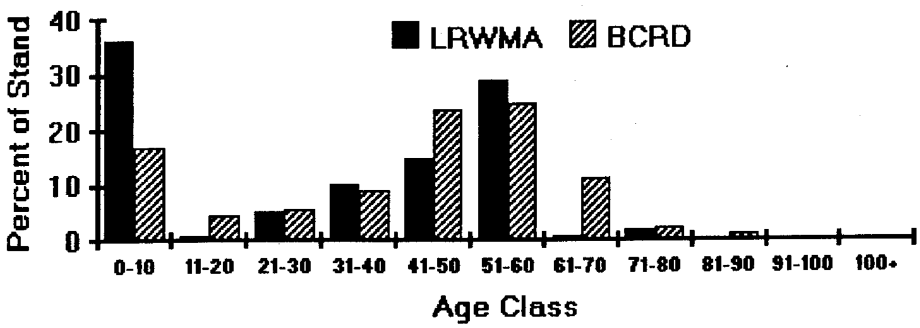

Figure 3-16 Age Class Distribution for Loblolly Pine in the Leaf River Wildlife Management Area and Black Creek Ranger District, De Soto National Forest, Mississippi.

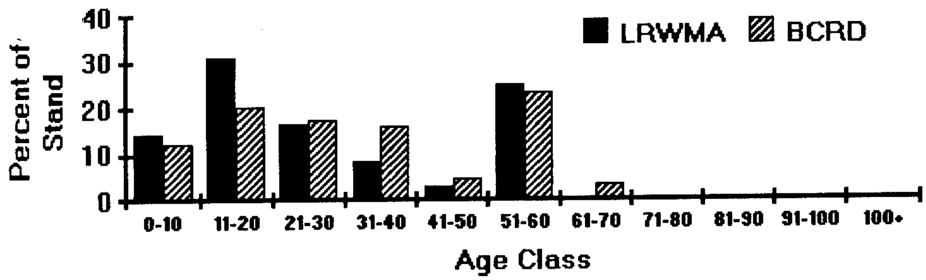

Figure 3-17 Age Class Distribution for Slash Pine in the Leaf River Wildlife Management Area and Black Creek Ranger District, De Soto National Forest, Mississippi.

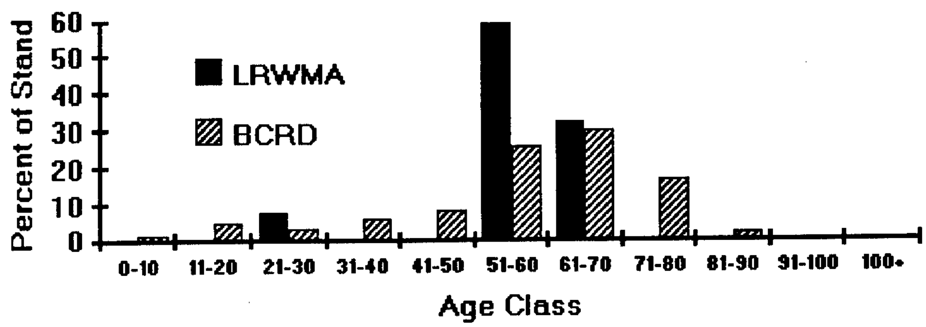

Figure 3-18 Age Class Distribution for Mixed Pine-Hardwoods in the Leaf River Wildlife Management Area and Black Creek Ranger District, De Soto National Forest, Mississippi.

3.1.7 Hazardous Waste Management

The training and maintenance activities of Camp Shelby generate waste materials that are categorized under the terms of the Resource Conservation and Recovery Act (RCRA) as hazardous. This classification means that special provisions must be made for the storage, handling and disposal of these wastes. These requirements are similar to those for many businesses and all other military installations. Each container of such waste must be labeled, safely stored, and picked up for off-site disposal or treatment by a contractor licensed to handle that type of waste. No on-site disposal is permitted, and none has taken place.

The recent history of Camp Shelby compliance with hazardous waste regulations does show one violation. All areas involved labeling and record-keeping requirements, and no release or improper disposal was involved. A full description of the circumstances of that violation is included to assist in placing the incident in perspective:

> In July of 1991, United States Environmental Protection Agency conducted a hazardous waste management inspection at Camp Shelby, MS. They found the following deficiencies: 1) Weekly inspections were not documented for two weeks at the less than 90 day storage area. 2) A container at Combined Support Maintenance Site did not have the word "waste" marked on it. 3) Some personnel had not received the appropriate hazardous waste training. Also, not all personnel had their hazardous waste duties listed in their job description or they had not been updated.
>
> The Mississippi Army National Guard (MSARNG) subsequently agreed to an order from the Mississippi Commission on Environmental Quality. This consent order required the MSARNG to correct all deficiencies noted during the July inspection or be fined $1000.00. All deficiencies were subsequently corrected.

On March 11, 1992, an inspection of the Camp Shelby Training Site by the Mississippi Department of Environmental Quality and the United States Environmental Protection Agency was conducted and no violations were noted. The inspection record indicated, "Camp Shelby staff are to be commended for correcting prior problems observed at the facility. Training records and manifests were easily reviewed during this inspection. All satellite storage areas and the 90-day storage area were well maintained. Each shop had an assigned hazardous waste coordinator who was doing an excellent job of managing the wastes generated." A joint inspection by EPA Region IV and the Mississippi Department of Environmental Quality in April, 1993, found no violations of hazardous waste regulations at Camp Shelby.

No environmental degradation through handling or disposal of hazardous waste has taken place as a result of military training at Camp Shelby. No pollution of land or water has taken place and none is anticipated. See also Section 3.2.2.3, and Camp Shelby Regulation, Annex G (in Appendix C, Part 11) where provisions for containing accidental spills are presented.

3.2 Present Mitigation Procedures Utilized

Current training area usage and facilities that cause damage to the environment are discussed in Section 2.1.1 and actual usage by training area or facility is summarized in Appendix C, Section 8. Procedures now used by Camp Shelby personnel to mitigate the known or potential negative effects of current training activities (as presented in Table 3-1) include soil erosion control, protection of TE&S species and their habitat, commitment to the Integrated Training Area Management (ITAM) program, and several measures related to Quality of Life (QOL) issues. The current nature and results of each of these procedures is discussed below.

LCTA methodologies (Tazik et al., 1991) will provide vegetative, wildlife (small-mammal and songbird in particular), and land-use data on an annual basis. Installation-wide estimates of vegetative conditions, soil erosion status, and the delineation of plant community types (which in turn can be related to wildlife abundance and diversity) can also be obtained. An interface with the GRASS geographic information system will permit the development of Camp Shelby-based models of species distribution and abundance that can be displayed as map layers, enhancing the Army's ability to monitor and manage wildlife and other natural resources.

3.2.1 Threatened, Endangered and Sensitive Species Management

Measures have been and are continually being taken to protect federal and state listed species. The current biological opinions to U.S. Forest Service (USFS) and National Guard Bureau/Mississippi Army National Guard (MSARNG) includes some specific conservation and management requirements for the gopher tortoise (USFWS Biological Opinions 1992 and 1993) and red-cockaded woodpecker (USFWS Biological Opinion 1983 and the Interim Guidelines for RCW Management) on Camp Shelby (Appendix L). Sites where red-cockaded woodpeckers or gopher tortoises occur are clearly marked and military activities are restricted when within 200 feet of a red-cockaded woodpecker or gopher tortoise colony site. Gopher tortoises colonies in forested environments are also restricted from training activity within 200 feet of the colony and individual burrows in non-wooded areas are marked to avoid disturbance. Gopher tortoise priority soils are avoided in all current activities and planning. Also important is Camp Shelby's on-going informational program aimed at educating both the military command and soldiers in the field about threatened, endangered and sensitive (TE&S) species and regulations governing their protection. Camp Shelby has and will continue to follow all guidelines provided by the USFWS Biological Opinions and the Forest Service (e.g., USFS Decision Notices, Finding of No Significant Impacts, Biological Evaluations, and Environmental Assessments) with regard to TE&S species. As these documents are completed, measures to prevent adverse effects to these species from proposed actions on Camp Shelby will be carried out. In addition, the establishment and preservation of T-44 as a long-term gopher tortoise refuge will provide a unique opportunity for cooperative research into questions concerning the gopher tortoise, and can be viewed as exemplifying the spirit of the National Guard commitment to the preservation and enhancement of the gopher tortoise.

The recent implementation (1990) of the U.S. Army's Land Condition Trend Analysis (LCTA) program on Camp Shelby will also assist in the management and protection of protected and sensitive species. Special-use plots (Tazik et al., 1991) were established in the gopher tortoise refuge (T-44) to provide long-term quantitative data to assist installation personnel in the management of the gopher tortoise. The forest habitat within T-44 is being managed by the U.S. Forest Service to benefit the gopher tortoise.

3.2.2 Protection of Soils and Wetlands

3.2.2.1 Erosion Control Program

Camp Shelby follows guidelines of their Erosion Control Plan for restoration of training lands. Agronomic measures are practiced to revegetate disturbed areas, and conservation structures are installed where and when appropriate under the provisions of the "Erosion Control Plan for Camp Shelby". This document was prepared by the Department of Wildlife and Fisheries, Mississippi State University and is referred to hereinafter simply as "Erosion Control Plan" (1988).

The Erosion Control Plan contains provisions for erosion control both during and immediately following the training season. Although the bulk of the plan is devoted to post training season mitigation as maximum personnel and equipment resources are available at that time; procedures are also outlined for monitoring and repair of erosion sites during the training season. This monitoring program consists of routine inspection to identify potential problem areas and to assess the condition of existing erosion control structures. The purpose of the monitoring program is to repair problem areas before erosion becomes critical, thus minimizing damage as well as expenditures of time and available resources necessary for repair. The monitoring program is prioritized based on erosion potential and the potential impact to sensitive areas. The plan calls for routine monitoring following training activities in a particular area, as well as monitoring before or after major precipitation events, depending on the type of area or structure in question. In order to minimize damage, repair activities, where required, will be performed as soon as possible, especially in those areas deemed to be high priority sites.

Areas receiving frequent heavy vehicle traffic are evaluated for off site erosion, sedimentation, or water course damage and repaired as needed. Degree and depth of compaction are two of the criteria used in determining the need for deep chiseling. Because of personnel requirements, equipment availability, site access (i.e., maneuvers may be continuing), and other problems, total control of erosional problems may not be attained during the most active training seasons. With regular inspection and preventative maintenance practices in place, however, the total effects of erosion can be significantly decreased with minimal expenditures of time and resources.

The most common implement used with the intent of destroying tillage pans and reducing subsoil compaction is the subsoiler. However, it has been reported that sometimes subsoiling to 16

inches did not increase yields. This and other research results lead to the conclusion that benefits from subsoiling are variable and relatively small in the Midwest (Swan et al., 1987).

During the latter parts of 1990 and early 1991, CERL researchers made several visits to Camp Shelby. The main objective of these visits was to evaluate the field implementation of erosion control practices, with particular reference to the identification and quantitative assessment of environmental impacts to Camp Shelby land resources. Except for a few isolated areas needing vegetal cover, they observed good ground and canopy cover on all the training sites. The reason for a such a healthy vegetation establishment lies in the fact that, besides erosion control efforts of Camp Shelby land managers, the area has nearly a year long growing season and 60 inches of precipitation per year, uniformly distributed, as shown in Table 2-4.

The Erosion Control Plan had identified several problem areas including ranges 12, 18, 40, 41, 43, and 44; tank assembly areas at Redbud Hill in T-28, and drop zone area in T-19; target areas and primary ridge tops within the impact area. The results of field observations of U.S. Construction Engineering Research Laboratory (USACERL) scientists (1990 and 91), and those of the Department of Wildlife and Fisheries, Mississippi State University as listed in the Erosion Control Plan (1988), and a USFS survey (1991) are compared in Table 3-11. From the data, it may be noted that vegetation establishment ranged from 80 percent to almost 100 percent during 1990, whereas in 1988 it was far less than 50 percent on a majority of the reported sites. Admittedly, there are differences in the standards and procedures used in the different surveys. The 1990 observations were taken following the annual major renovation and repair efforts, whereas the 1988 and 1991 data were obtained during periods of active training. The 1990 observations also recorded canopy cover ground cover and litter as cover, while the other surveys measured cover specifically at ground level. Even the lower 1991 values, however, show improvement over the pre-Erosion Control Plan status.

As presented in Section 3.1.1.3.4, the overall erosion rate for the permit area is approximately 0.96 in the absence of specific erosion control practices. The effectiveness of application of these practices, as well as the added mitigation developed for the new proposed training areas, and which has been or will be applied to the present areas is demonstrated as the erosion rate is reduced to 0.35 when all present and proposed mitigation is applied.

The current status of the effectiveness of erosion control practices at some of the training areas is further described in Section 3.2.2.3. Many of the observations in that text are stated in terms of vegetal cover. This is because vegetal cover is an excellent indicator of good land management practices. It is known that a good vegetative cover, such as a thick sod or a dense forest, offsets the effects of climate, topography, and soil on erosion. Although the training requirements of Camp Shelby cannot be met by having all the land covered with trees and grass, vegetation effects play a significant role in controlling erosion, even under training conditions. The major effects of vegetation may be classified into at least four distinct categories: (1) the interception of rainfall energy, (2) the decreasing of the velocity of runoff and the cutting action of water, (3) the root effects in increasing granulation, porosity,

and biological activities associated with vegetative growth, and (4) the transpiration of water leading to the subsequent drying out of the soil (Baver, et al., 1972).

After active duty training in August, Camp Shelby launches an aggressive campaign for the restoration of disturbed areas. As shown in Table 3-12, thousands of man and machine hours are expended in seed bed preparation and revegetation of disturbed lands, in grading/repairing and the maintenance of 320 miles of gravel and dirt roads, and in the building of an extensive network of terraces, water bars, wingcuts, and road turnouts. Shown in Table 3-13 are the amounts of seed, fertilizer, and lime that were applied aerially during the last three years. However, there are problem areas at Camp Shelby which need erosion control measures as discussed below in Section 3.4.4.

Table 3-11
Comparison of Percent Canopy Cover Before and After Field-Implementation of Erosion Control Plan

Site	% Vegetation		
	1988[1]	1990[2]	1991[3]
Range 6	41	85	
Range 12	14	85	
Range 13	52	90	
Range 18	38	95	59
Range 18 - Compacted Site	9	95	18
Range 40 - Between Firing Lanes	25	95	70
Range 41 - Between Firing Lanes	32	98	69
Range 42 - Pistol Range	69	95	69
Range 45	64	95	74
Range 47	52	95	
Lake Janney Area	24	90	75
Roadside Across From Range 44	36	90	
T-28 - Adjacent to Roadside Redbud	42	90	
T-19 - Drop Zone	49	90	72
T-44	79	85	71

[1] - Observation made in middle of active training season.
[2] - Observation made during inactive season, following revegetation. Canopy cover as well as groundcover included.
[3] - Observation made during training season; only groundcover included on undisturbed sites.

3.2.2.2 Wetland Protection

Wetlands and associated 100 foot buffers in current tracked training areas have been marked on the ground and designated as "Off Limits". This requires that crossings occur only at specified locations. Camp Shelby environmental personnel are locating and constructing improved crossings at a smaller number of approved locations. There are two environmental benefits associated with the construction of improved crossings. First, a smaller number of areas were used and they are selected to have minimum environmental sensitivity. Second, the erosion and subsequent sedimentation are reduced when the crossing surface is improved.

Table 3-12

Land Rehabilitation Labor and Materials for Camp Shelby in FY 1992* and 1993**

		1992			1993		
Stock	**Issue Unit**	**Price**	**Quantity**	**Total**	**Price**	**Quantity**	**Total**
Labor	**Hour**	11.84	4,044	47,880	12.50	4,500	55,845
Dozer Rental	Ea.		D5 x 3	59,700		D5 x 4	79,600
Tractor Rental	Ea.	-	-	-		3	10,815
Rye Grass	lb.	.20	36,550	7,310	.33	48,000	15,840
Bahia Grass	lb.	.52	17,850	9,282	.64	24,000	15,360
Lespedeza	lb.	.54	17,400	9,396	.54	24,000	12,960
Bermuda	lb.	2.05	8,850	18,142	1.79	12,000	21,480
Fescue	lb.	.34	4,300	1,462	-	-	-
Clover	lb.	.74	8,950	6,623	.50	16,000	8,000
Vetch	lb.	.64	8,900	5,696	.64	16,000	10,240
Hay	bale	1.85	1,478	2,734	1.85	2,000	3,700
Lime	bag	2.53	12,000	30,360	-	-	-
Fertilizer	bag	3.99	8,040	32,079	-	-	-
Fertilizer	bag	4.10	6,550	32,079	-	-	-
Fertilizer	ton	-	-	-	157.00	375	58,875
TOTAL				$257,519			$292,715

*This labor and material was used to rehabilitate 1,035 acres of land at Camp Shelby in FY 92
**This labor and material was used to rehabilitate 1,200 acres of land at Camp Shelby in FY 93

3.2.2.3 Soil Contamination

Protection of the soil environment from spills of fuel during the course of field exercises was recognized as a hazard in Section 3.1.1.3.5. In practice, extensive precautions are taken whenever field refueling must be a part of an exercise. Fuel bladders cannot be placed on the ground without prior site approval from the U.S. Forest Service. The site must be surrounded by a berm capable of holding the entire contents, should the bladder leak. The refueling operations must comply with the Camp Shelby *Spill Prevention, Control, and Countermeasure Plan* (Annex F to the Camp Shelby Regulations).

Table 3-13
Aerial Seedings for Camp Shelby in FY 92

Area	Acres	Type Material	Material Total in Tons	Cost
Impact Area	1600	Pelletized Lime	1,600.0	$273,312.00
	800	13-13-13 Fertilizer	240.0	68,248.00
	800	Rye Grass	16.0	16,344.00
	800	Arrow Leaf Clover	6.0	12,360.00
	800	Pensacola Bahia	10.0	20,600.00
	800	Sericia Lespedeza	10.0	20,600.00
		Subtotal		$411,464.00
Tank Ranges	600	Pelletized Lime	600.0	102,493.00
	600	13-13-13 Fertilizer	180.0	51,186.00
	600	Rye Grass	12.0	12,258.00
	600	Arrow Leaf Clover	4.5	9,270.00
	600	Pensacola Bahia	7.5	15,450.00
	600	Sericia Lespedeza	7.5	15,450.00
		Subtotal		$206,106.00
Drop Zone	435	Pelletized Lime	435	74,306.70
	435	13-13-13 Fertilizer	130.5	37,109.85
	435	Arrow leaf Clover	3.3	6,720.75
	435	Pensacola Bahia	5.4	11,201.25
	435	Sericia Lespedeza	5.4	11,201.25
		Subtotal		$140,539.80
		Grand Total		$758,109.80

3.2.3 Utilization of Integrated Training Area Management (ITAM)

Integration of the Army's ITAM program (Appendix G) into the land management process at Camp Shelby has in part, provided installation personnel with the resources to make more informed land and wildlife management decisions. ITAM is composed of several distinct but related elements: 1) Land Condition Trend Analysis (LCTA); 2) Training Requirements Integration (TRI); 3) Environmental Awareness (EA); 4) Land Rehabilitation and Maintenance (LRAM); and 5) Decision Support Systems. The implementation process for LCTA, EA and the decision support systems began in 1990 and were fully implemented in 1993. TRI and LRAM are still in the implementation phase. Each component is briefly described below, and in greater detail including implementation and operational costs and schedules, in Appendix G.

Primary objectives of the LCTA component are to evaluate the capability of the land to meet multiple use demands on a sustained basis, monitor changes in land and wildlife resources, and recommend changes in management plans to insure long-term resource availability. Also, utilizing standardized data collection (Tazik et al., 1991), analysis and reporting methods will enable natural resource data compilation and analysis on an Army-wide basis. As an example, LCTA technologies will allow for the identification and delineation of unique ecosystems and areas containing sensitive species. Management of military activities may then be adjusted in these areas to avoid future conflicts. Initial analyses of the 1991-92 LCTA data have been completed and are summarized in a progress report. These data have been used extensively in Sections 3.1 and 3.2 of this document.

The Environmental Awareness (EA) Program is designed to describe an installation's natural resources and to prevent environmental damage on ARNG training lands (Anderson et al., 1981; ITAM Bulletin, 1990; Severinghaus and Denight, 1993). The EA program is a preventative measure: it is intended to educate commanders and soldiers about the importance of the environment to their mission and the consequences of environmental damage to an installation's training resources. This educational program is based upon a multi-media approach that provides an overview of the terminal learning objectives, detailed information about post environmental regulations, examples of specific training activities that will help units maintain environmental compliance, and reinforcement of enabling and terminal learning objectives of the program. Typically, the EA program consists of four elements to achieve these goals, and all elements should be implemented in order to ensure that the learning objectives are adequately covered and reinforced during training.

The EA program elements used at Camp Shelby include:

- Videotape: A videotape is available to educate leaders and soldiers about environmental considerations and Camp Shelby regulations which pertain to the conservation of training resources. The videotape is intended to be shown to unit leaders in order to communicate the importance of preserving the environment. Screenings of the video take place during pre-camp briefings required of units prior to deployment to Camp Shelby.

- Posters: A series of poster designs are being developed to remind training unit personnel of the importance of environmental compliance and conservation. Posters are intended for display in high visibility areas such as barracks, range briefing areas, post exchange, cafeterias and any other high traffic public areas.

- Handbooks: Handbooks are available for soldiers. Leader handbooks are currently under review by installation personnel. These handbooks include detailed environmental compliance procedures, as well as standard operating procedures in case of any accident.

- Field Cards: Field cards are distributed to military personnel prior to deployment to Camp Shelby. It has been recommended that troops be required to carry these cards at all times during field training exercises.

Decision Support Systems including PC based front end programs and GRASS support ITAM by providing point and spatial data analysis and graphic support for the decision-making process. These systems are fully functional on site at Camp Shelby and the State Headquarters in Jackson.

TRI creates an interface between trainers and land managers that will result in the protection of natural resources and adequately support the training mission. This is realized through the analysis of current and projected levels of training with the current and projected condition of available training lands. For Camp Shelby, this is described in detail in Appendix G as a joint evaluation effort between representatives of Range Control, Directorate Facilities Engineering (Environmental Section), the unit proposing the training, and the Forest Service.

LRAM objectives are to: 1) provide guidance and technology for the planning, design, and construction of land restoration projects; 2) establish long-term land maintenance programs; 3) improve vegetation cover to enhance training area for realism; 4) improve vegetation cover to reduce soil loss and protect long-term soil productivity; 5) control runoff to reduce erosion and protect riparian areas; 6) repair gullies and other landscape damages; 7) control sediment transport to maintain water quality and protect wetlands. The LRAM component of ITAM is further explained in Section 3.4.4.2.

A substantial monetary commitment from the National Guard Bureau, the Mississippi Army National Guard, and Camp Shelby has been made with respect to implementation of ITAM. In 1991, Camp Shelby provided $637,700 for FY91 implementation of ITAM. The FY92 and FY93 ITAM expenditures were $408,700 and 410,900 respectively in Appendix G. Much of the data collected on LCTA plots in 1991-92 have been incorporated into this EIS. Several more years will be required to fully implement the TRI and LRAM thrusts of ITAM. More importantly, however, ITAM provides a process that will help military land managers provide sustainable realistic training conditions on Camp Shelby into the next century while addressing the needs of wildlife, recreationists, and the land.

3.2.4 Quality of Life

Camp Shelby Operating Regulations: Camp Shelby is used as a training facility for Annual Training (AT) and Inactive Duty Training (IDT) from ground based units, aviation units, and Air National Guard units from Mississippi and adjacent states. The types of units training at Camp Shelby include armor, armored calvary, aviation, engineer, field artillery, infantry, medical, military police, special forces, support and supply transportation, headquarters and quartermaster. Types of present activities that take place at Camp Shelby are provided in section 1.2.1.1. In order to minimize affect of these activities on the quality of life of residents living nearby, mitigation measures include: (1) Camp Shelby Regulation, General (1992); (2) Annex C, Range Regulation (1993); (3) Annex G, Environmental Protection (1992); and (4) Annex S, Safety (1992), which can be found in Appendix C.

Land Use Restrictions: Figure 2-1 shows the existing ranges, numbered training areas and the current impact area at Camp Shelby. All firing ranges and the impact area are located west of Highway 29. This means that routine weapons firing activities do not interrupt traffic on any public roads. On the few days a year when long-range artillery does fire from selected points *east* of Highway 29, a special standard operating procedure (SOP) for closure of Highway 29 is implemented (Annex C, 1993). Annex C is located in Appendix C. When maneuver training activities temporarily interrupt traffic flow for short periods, other parts of the SOP assure separation of military and civilian vehicles. There are also certain requirements for movement of vehicles on roads and trails, such as speed limits, lights of vehicles to be on during movement (unless otherwise specified), and use of road guards to control traffic (Annex C in Appendix C, 1993).

Recreation Availability: The annual schedule of training activities is planned so that training exercises which would close access to public hunting areas do not take place during the Mississippi deer (with dogs) hunting seasons. This is the most intensive recreation use experienced in the Special Use Permit (SUP) area. Military training does not conflict with most recreation uses (Appendix F).

Dust Suppression: As stated in Section 3.1.3, density and duration of dust generated depends on the number and type of vehicles moving along a road at a time as well as on the lack of moisture in the road bed. When there is a lack of moisture in the road bed, trails are kept moist by sprinkling water on them. Tank trails that parallel Highway 29 have thinned buffers around them, there are also buffers between state and county roads and corridors to maneuver areas.

Smoke and Obscurants: Tactical smoke devices may be used in the field training areas. The commander initiating use of such devices must ensure that measures are taken to prevent damage to trees and prevent and/or extinguish forest fires resulting from their use (Annex G, 1992). The field manual on smoke operations (FM 3-50, 1990) provides the units with procedures, tactics, and techniques for the use of smoke and obscurants. Annex C (1993) also describes procedures and safety precautions for use of pyrotechnics at Camp Shelby. Both Annex C and Annex G can be found in Appendix C.

Noise Mitigations: A Camp Shelby Noise Complaint Recording Standard Operating Procedure (SOP) for recording and investigating noise complaints is in place. The Army National Guard units do not fly below 800 feet above ground level in those areas considered "populated," which includes the entire area between US Highway 98 and the northern boundary of the Camp Shelby permit area. Neither Army nor Air Force aircraft are allowed to fly below 2000 feet over the Black Creek Wilderness or the Leaf Wilderness areas. Aircraft must also maintain 1,000 feet minimum altitude when within 1,000 meters laterally of the Black Creek Scenic River.

Noise Complaint Program: Camp Shelby has maintained a noise complaint program for many years, as noted above. This program provides a single telephone number to receive all noise complaints which the public believe are resulting from Camp Shelby training activities. Between the beginning of 1988 and the end of the 1993 training year (August 1993), 63 separate complaints were logged. They are summarized in Table 3-14.

Revised Flight Paths: Following analysis of comments on the Draft EIS, and examination of the data incorporated in Table 3-14, positive steps were taken, in June 1993, to address certain issues relating to noise generated from operation of high-performance (i.e., Air Force and Air Guard) aircraft in the Camp Shelby vicinity. In the first of these actions, the integrated nature of the noise complaint program was reiterated. Under these procedures, Camp Shelby Range Control clearly assumed responsibility for receiving and logging noise complaints which were related to Air Guard activities, and for transmitting these to the Air Guard operations center as appropriate. Second, the Air National Guard flight operations staff

agreed that a revised flight pattern, proposed by the Army as a result of EIS analysis, could be implemented. Beginning in June, 1993, the "return to target" flight path for the west air-to-ground range at Camp Shelby was made clockwise, rather than counterclockwise. The effect of this change is to remove the majority of the overflight noise experienced by residents along Paret Tower Road (FS 302), south of the impact area and west of Paret Tower. This noise effect was discussed in Section 3.1.5.2. The revised flight path is shown in Figure 3-19. Compare this with Figure 2-3B to see the effect of this change in the return to target flight path. Recently established "no-fly" zones and altitude restrictions over populated areas are now in use and are also shown in Figure 3-19.

Table 3-14 Summary of Camp Shelby Noise Complaints 1988-1993

Source of Complaint	1988	1989	1990	1991	1992	1993
Jet Aircraft	2	3	8	2	3	0
Helicopters	0	3	0	2	1	4
Prop Aircraft	0	0	3	0	1	0
Unknown air	0	2	1	0	0	0
Bombs	6	7	0	0	2	0
Tanks	0	1	0	0	0	1
Unk blast	0	1	0	0	0	0
EOD	0	0	2	0	0	0
Demo	0	0	1	0	0	0
Artillery	0	0	2	4	1	0
Annual Total	**8**	**17**	**14**	**8**	**7**	**5**
Air Force	8	10	8	2	5	0
Army A/C	0	5	1	2	1	4
Ranges	0	2	5	4	1	1

3.3 Proposed Status Following Implementation of Action(s)

The consequences of the proposed alternative actions, as discussed throughout Section 3.3, are stated in terms of their consequences beyond the effects of present activities, which have been examined in Section 3.1).

3.3.1 Physical Environment

3.3.1.1 Climate

Proposed activities consistent with Alternatives 1-6, discussed in this document, will not have a significant effect on the general climatic patterns or climatological parameters in or around the Camp Shelby area. Microclimates of areas proposed to be cleared or returned to forest management will be modified. The resultant changes are discussed as effects on plant and animal communities below. Little influence would be expected from any of the proposed activities on the precipitation patterns, mean temperatures and prevailing winds typical of the regional climate (Table 2-4). Conversely, climate can affect conditions for training activities.

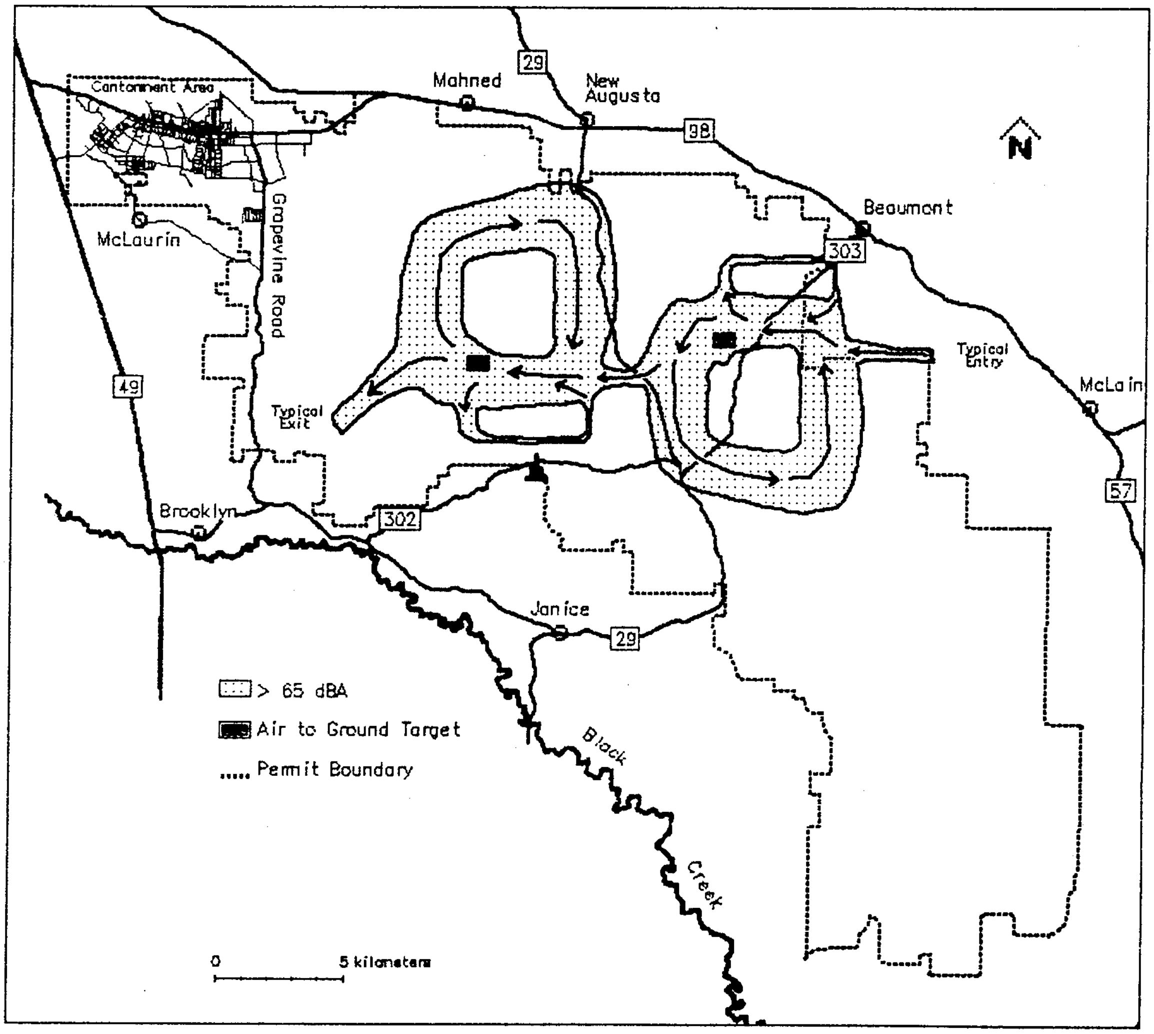

Figure 3-19 Noise Contours for Air National Guard Activities Following Revision of Flight Paths for Range 202W in June 1993

3.3.1.2 Landforms

With the exception of Automated Tank Table VIII and the Multiple Purpose Range Complex-Heavy, proposed training areas and maneuver activities included in training mission Alternatives 1-5 will not have significant effects on the land forms at Camp Shelby. Alternatives 5 and 6 do not include tracked vehicle maneuver training.

Automated Tank Table VIII (ATT-VIII): The proposed Automated Tank Table VIII, consistent with training mission Alternatives 1-5 (see Section 1.2 of this document), will not require significant alteration of landform as now proposed. Construction of the ATT VIII will have a measurable effect on a localized area of the landform on Range 45 (Figure 3-20). As described in Section 3.3.1.3 below, a hill on the northeast side of the STAB RUN will need to be cut to allow line-of-sight from defilade positions and moving firing positions along the STAB RUN to the appropriate targets. The amount of cut required from the hill is 175,000 cubic yards, the amount of fill required for roads, targets and other construction is 156,500 cubic yards (Table 3-15). The cut from the hill can be used for the required fill and the balance (18,500 cubic yards) will be stored in an existing borrow pit on range 45 for future use. Guidelines set by the Camp Shelby Erosion control program will be followed during the cut and fill process (see section on mitigation, Section 3.4).

Multiple Purpose Range Complex-Heavy (MPRC-H): The MPRC-H is proposed for mission Alternatives 1-3B and 5. Approximately 3/8 of the preferred site is an existing range and would require no land form alteration. The remaining area would require measurable land form alteration in the form of cut and fill (approximately 295,000 net cubic yards of fill) and regrading because the existing relief of the area will preclude proper lines of sight from the planned firing points to the target areas (Table 3-16 and Figure 3-21).

Consequences of constructing the MPRC-H on this site and required mitigation procedures are discussed in Section 3.3.1.3. Construction of the multiple purpose range complex-heavy (MPRC-H) on the alternative site was precluded because of threatened and endangered species constraints (see Section 3.3.2.5 and Appendix L), therefore further detailed examinations were not performed on the alternate site.

Automated Tank Wash Facility

Explosive Ordnance Disposal (EOD) Facility

Combined Arms Live Fire Exercise Assembly Areas (CALFEX-AA): The Automated Tank Wash Facility, Explosive Ordnance Disposal Facility and the Combined Arms Live Fire Exercise Assembly Areas, proposed in Alternatives 1-5 will not have measurable effects on land forms at either the preferred or alternate sites. Earth moving requirements are considered minor, similar to preparing a widened roadbed, for any of the assembly areas. Some earth moving, similar to a minor construction site, will be required for the tactical operations center (TOC).

Table 3-15

Engineering Requirements and Environmental Parameters Which May be Affected During Construction of the Range 45 Tank Table VIII Upgrade.

	Soil Cuts*	Soil Fill*	Acres Reveg	Acres Wetland	Acres Wetland Timber	Wetland Crossing	No. of Trees to be cut	Acres of non-wetland timber
Roads A, B, C, D, E	36170	66206	15.6	1		3		
Hardstand		9713	0.7					
Moving Targets		61494	7.1					
SPT's		582	12.3		10		27000[1]	
SAT's		7732	2.5				3000[1]	
Defilade Positions		3106	0.5					
Stab Run	138830	7667	32					
Total	175000	156500	70.7	1	10	3	30000[1]	100

[1] Stems of tree species, which average less than 1½ inches in diameter
*Cut and fill values are corrected to compensate for expansion of cut soil and compaction and settling of fill soil.
**Includes areas that presently need rehabilitation.

Table 3-16

Estimated Volumes of Soil Cut and Fill for Proposed MPRC-H

Element	Cut (Cubic Meters*)	Fill (Cubic Meters*)
Trail A1	1,242	15,318
Trail A2	1,802	9,353
Connect Trail A1 to Trail A2	295	448
Trail B1	3,335	5,920
Trail B2	3,031	6,418
Trail C1	1,966	8,396
Trail C2	1,220	31,951
Connect Trail C1 to Trail C2	112	1,292
Mobile Target A1	0	14,027
Mobile Target A2	0	13,483
Mobile Target A3	0	14,060
Mobile Target A4	0	9,782
Mobile Target B1	0	9,750
Mobile Target B2	0	9,754
Mobile Target B3	0	9,937
Mobile Target B4	0	9,650
Mobile Target C1	0	9,924
Mobile Target C2	0	10,483
Mobile Target C3	0	10,042
Mobile Target C4	0	9.963
Stationary Targets (Total)	0	10,200
TOTALS	13,003	220,151

* Cubic meters were used because the engineering data were originally calibrated in meters. For comparisons, one cubic meter equals approximately 1.43 cubic yards.

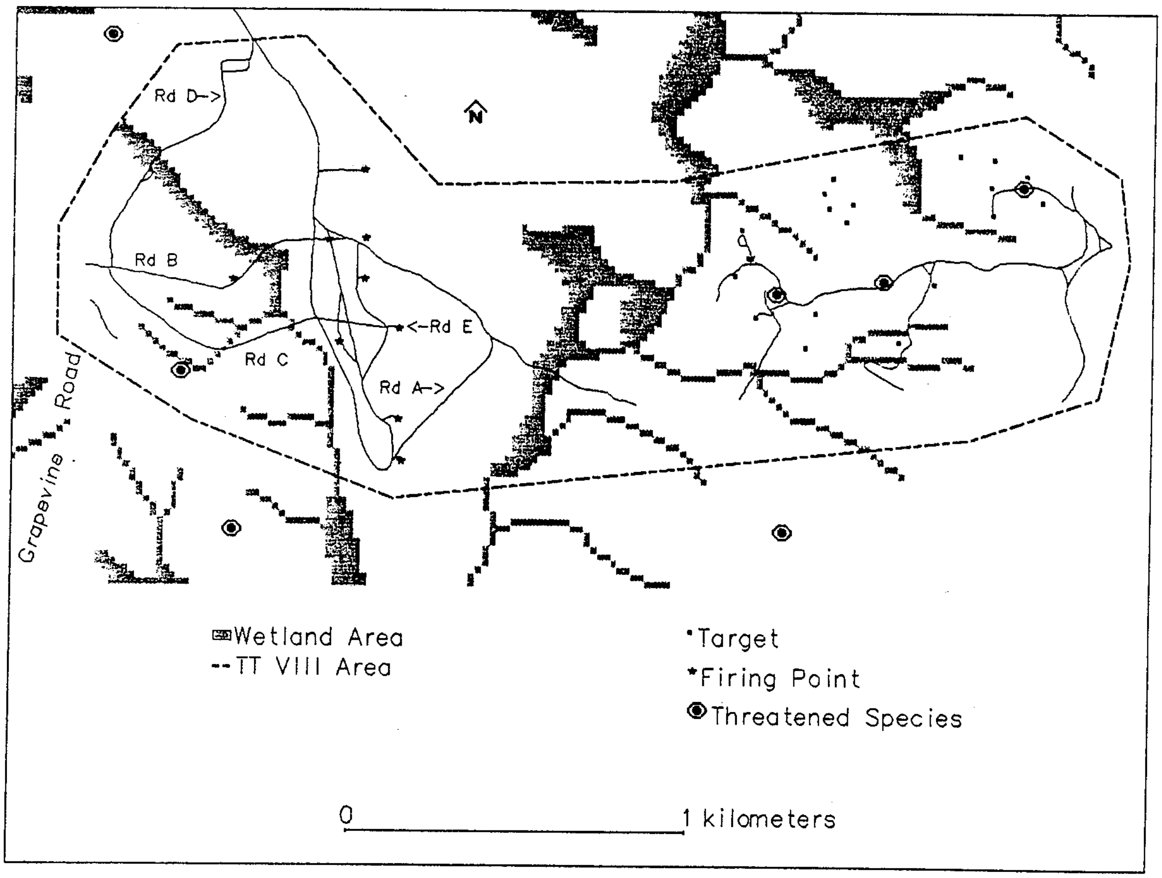

Figure 3-20 Present Environment - Tank Table VIII

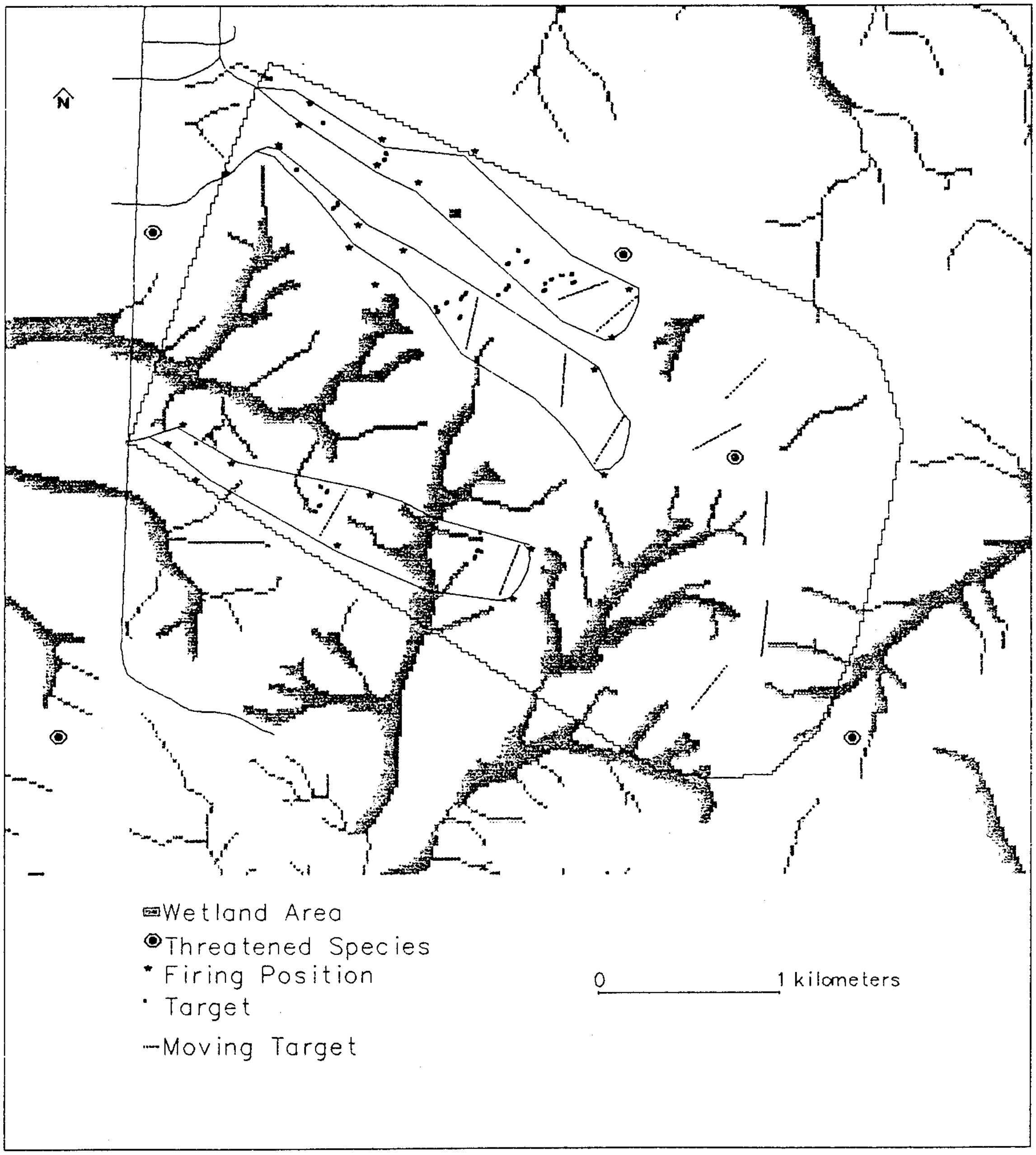

Figure 3-21 Present Environment - Proposed MPRC-H Site

Tactical Aviation Training Areas (TAAs): As described in Section 3.3.1.3, approximately one-half of the area within the preferred and alternate sites would be required to have slopes of no more than 6 percent. In some sections of some sites this would require substantial earth movement and result in a measurable effect on landforms of the areas. The environmentally preferred sites are largely level, with slopes within the central zone of no more than 8 percent. Detailed analyses of the effects are discussed in Section 3.3.1.3, in conjunction with soils.

3.3.1.3 Soils

The proposed locations and acreages of training areas for Alternatives 1-3A (see Figures 1-12 through 1-15 and Table 3-17) were designated based on relative land capability, as described in Section 1.2. All soils on Camp Shelby were assigned an index value ranging from 1 to 12 based on a combination of erosion potential and revegetation potential. Proposed training areas (PTAs) were then limited, to the extent possible, to areas with a combination of moderate to low erosion potential and moderate to high revegetation potential with the exception of wetland areas which will be excluded from training (Table 3-17). These criteria could not be met in designating PTA 5 due to the requirement in Alternatives 3A and 3B that training be restricted to an area north and west of Forest Service road 303 (Figure 1-15). This alternative was suggested during a public scoping meeting.

Maneuver training under Alternative 1 would provide space, after proposed clearing and thinning (Figures 3-22, 3-23 and 3-24), for two battalion task forces to maneuver in and through PTAs 1, 2 and 3 and proposed Corridors A-D, F and G (Figures 3-25, 3-26, and 3-27 and Tables 3-16 and 3-17) under several battle scenarios. An example of a typical scenario is discussed in detail in Section 1.2.8.1.2 (Figures 1-16 and 1-17). Events of this magnitude would take place during a maximum of six two-week annual training (AT) periods. In recent years Camp Shelby has only used five two-week AT periods. Actual field engagements would range from 6-8 days during these summer AT periods. In addition, up to 12 weekends might be used (1-1.5 days per weekend) for up to and including task force level maneuvers outside the AT periods.

The effects on the soils of just one of these maneuver events could range from minor to extensive depending on conditions of the soils at the time. In general, disturbance to the soils in question (soils index 1-5) from a one time pass of a tracked vehicle when the soil is dry will be naturally mitigated within one year, based on unpublished data from Fort Hood, Texas (also see Section 3.5.2.1.1 of this document). If the soil is wet, compaction can be measurable for several years. Therefore, mitigation measures must be taken to prevent long-term damage to the soils. Possible mitigation includes ceasing maneuvers when soil moisture is at or above a level where maneuvering causes excessive damage (see Section 3.4.5.1), and repairing damage as soon as possible after the training event, if necessary, or season. The ITAM Program contains provisions and a strong commitment for either procedure or a combination of both.

Table 3-17

Environmental Set-asides for All Proposed Training Areas and Corridors (Acres)
(The Values Cannot be Summed Because Categories May Overlap)

Area	Gross Acres	Wetlands +buf	RCW Colony	Gopher +buf	StrmHead +buf	Slope >10%	Gopher Soil
PTA 1	9,826	1,907	27	315	513	173	441
PTA 2	15,914	3,577	28	302	582	246	1,096
PTA 3	4,856	387	13	23	561	260	121
PTA 4	1,874	409	0	20	16	10	0
PTA 5	2,851	43	0	69	296	268	26
PTA 6	9,175	2102	27	934	125	73	24
Corridor A	608	21	17	19	31	11	16
Corridor B	522	71	0	0	24	9	0
Corridor C	2,024	231	0	21	114	69	34
Corridor D	557	4	0	13	70	61	0
Corridor E	272	76	0	71	5	1	0
Corridor F	424	163	3	0	0	1	0
Corridor G	782	133	0	15	11	4	0
Corridor H	757	2	0	19	107	96	0
Corridor I	170	23	0	0	5	0	0
Corridor J	199	0	0	10	13	7	0
Corridor K	289	85	0	0	1	1	0
Corridor L	146	108	0	0	0	0	0
Corridor M	302	69	0	0	4	6	0
ALT 1	35,512	6,495	88	709	1,906	833	1,708
ALT 2	31,824	6,334	72	761	1,363	584	1,593
ALT 3A	11,601	1,084	16	215	1053	697	146
ALT 3B	21,883	3,472	43	1160	1,201	783	170
Alt 4	17,561	3,029	36	927	820	404	691

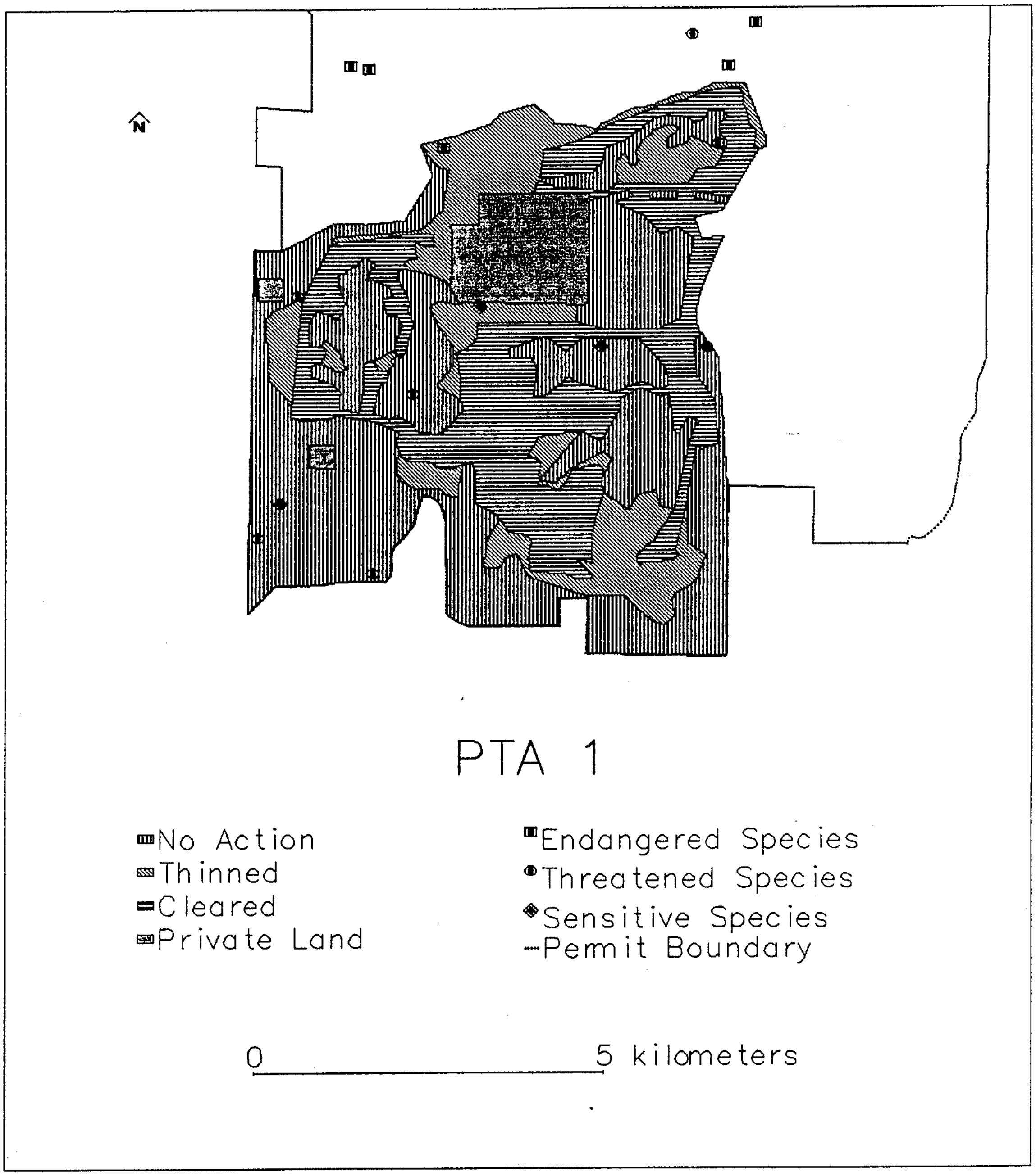

Figure 3-22 Conceptual Layout for Clearing and Thinning - PTA 1

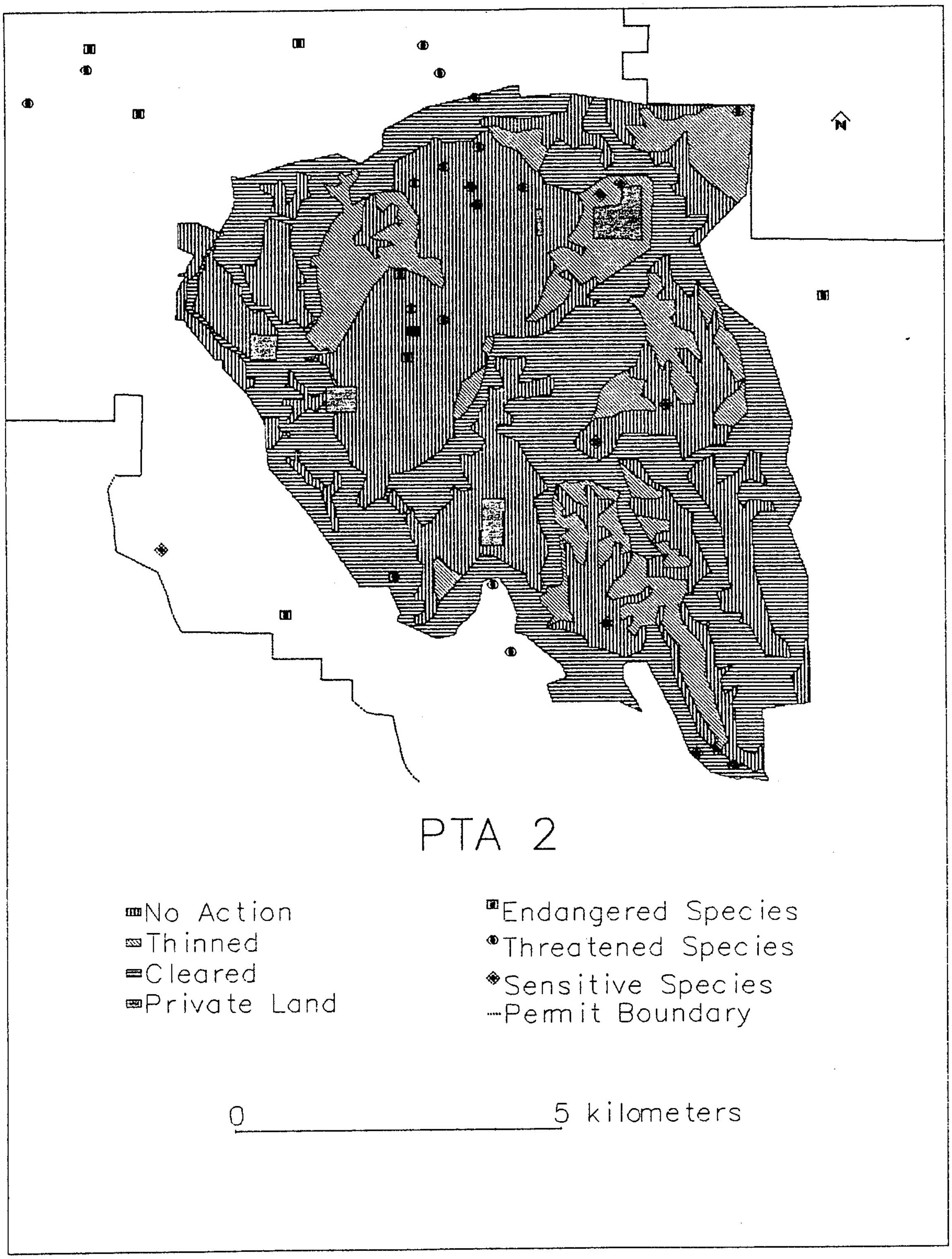

Figure 3-23 Conceptual Layout for Clearing and Thinning - PTA 2

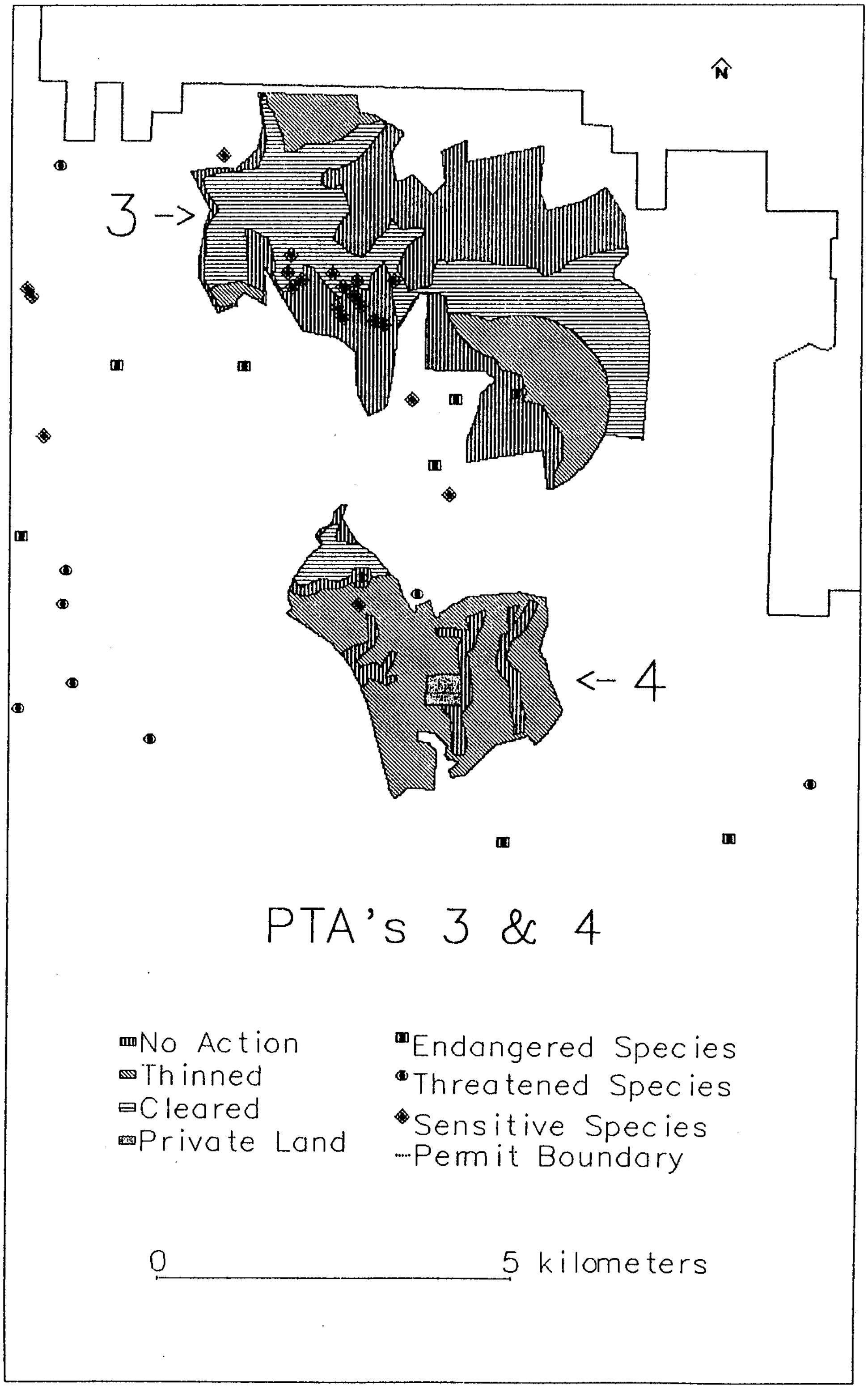

Figure 3-24 Conceptual Layout for Clearing and Thinning - PTA 3 and 4

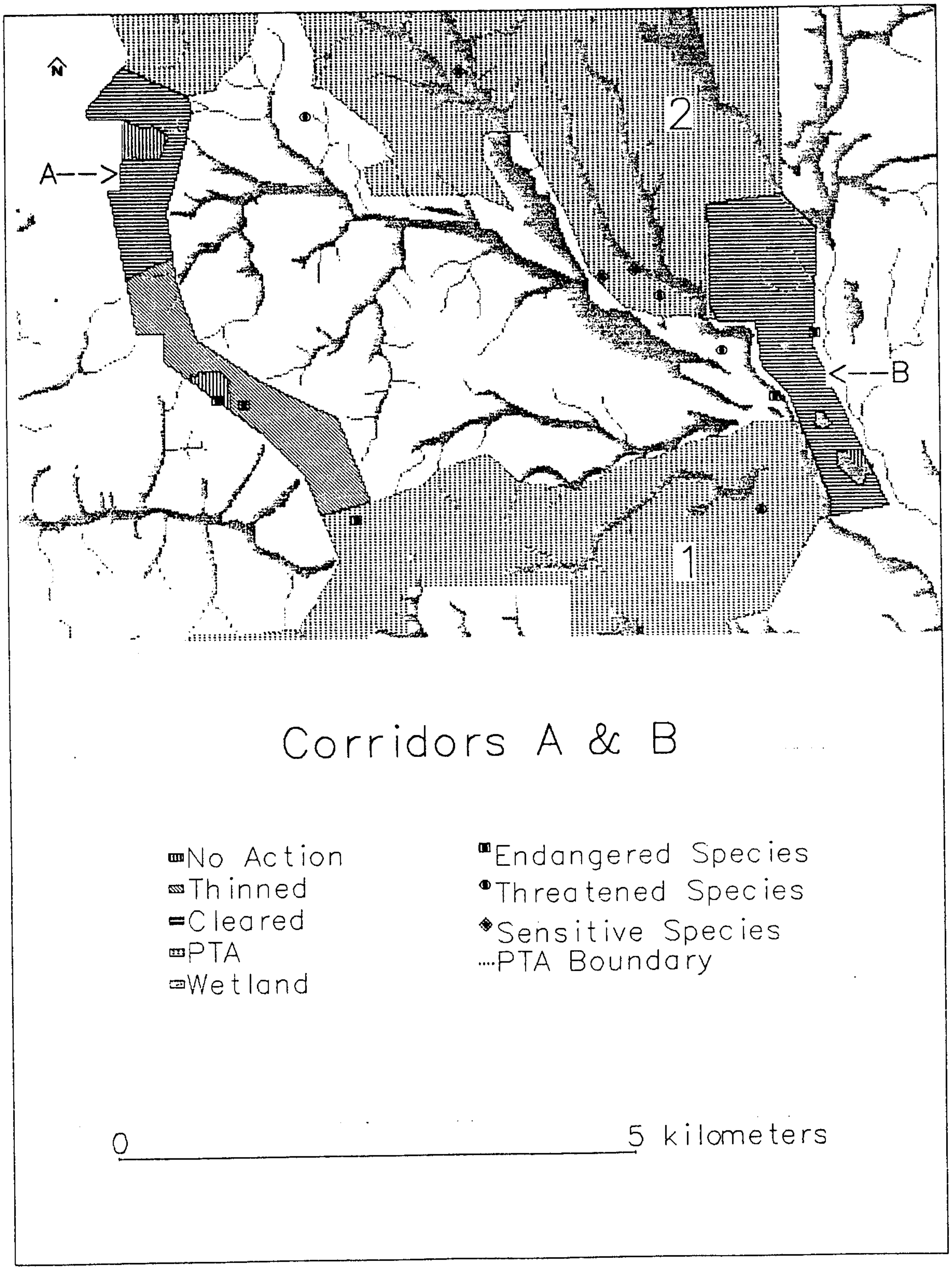

Figure 3-25 Conceptual Layout for Clearing and Thinning - Corridors A and B

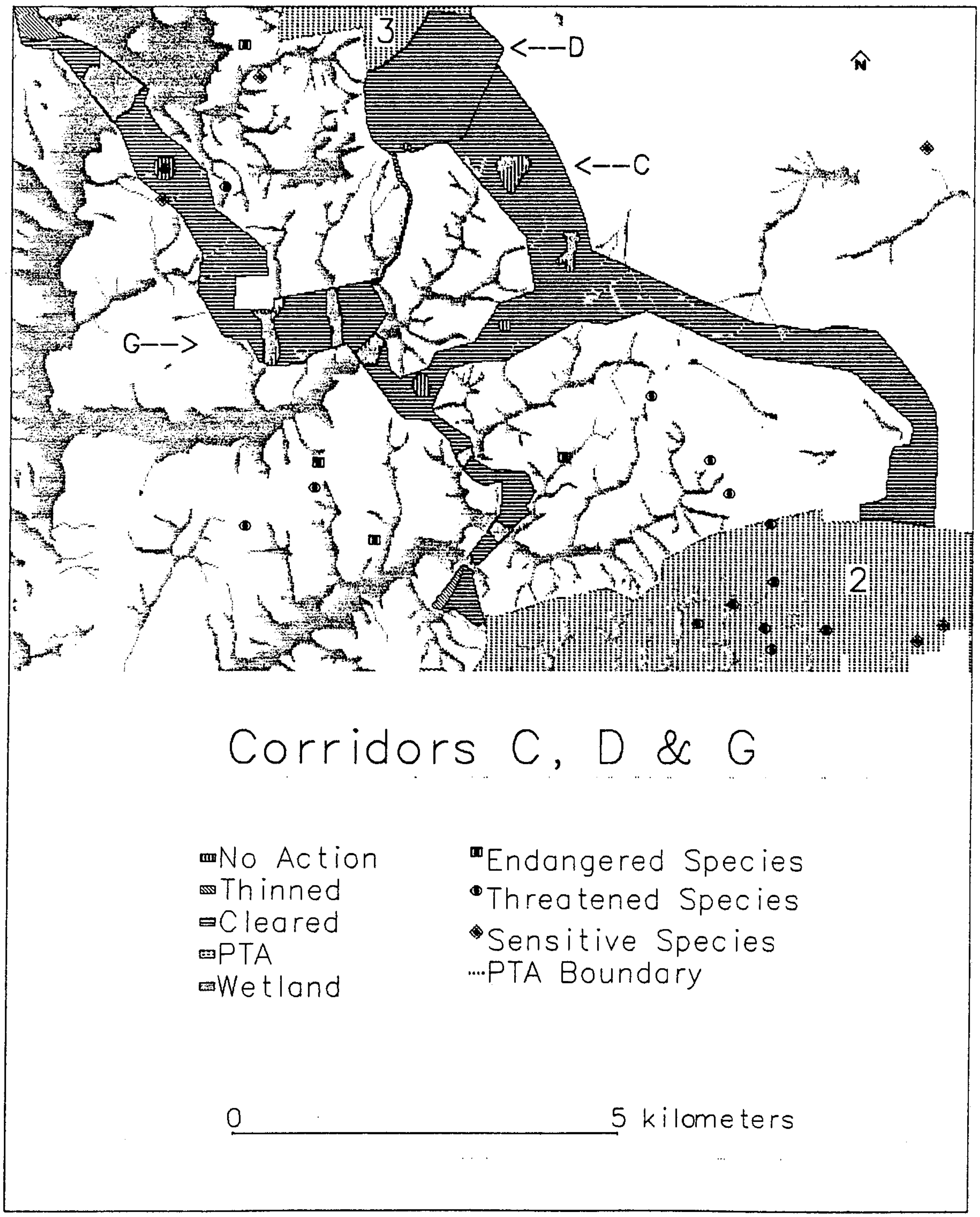

Figure 3-26 Conceptual Layout for Clearing and Thinning - Corridors C, D and G

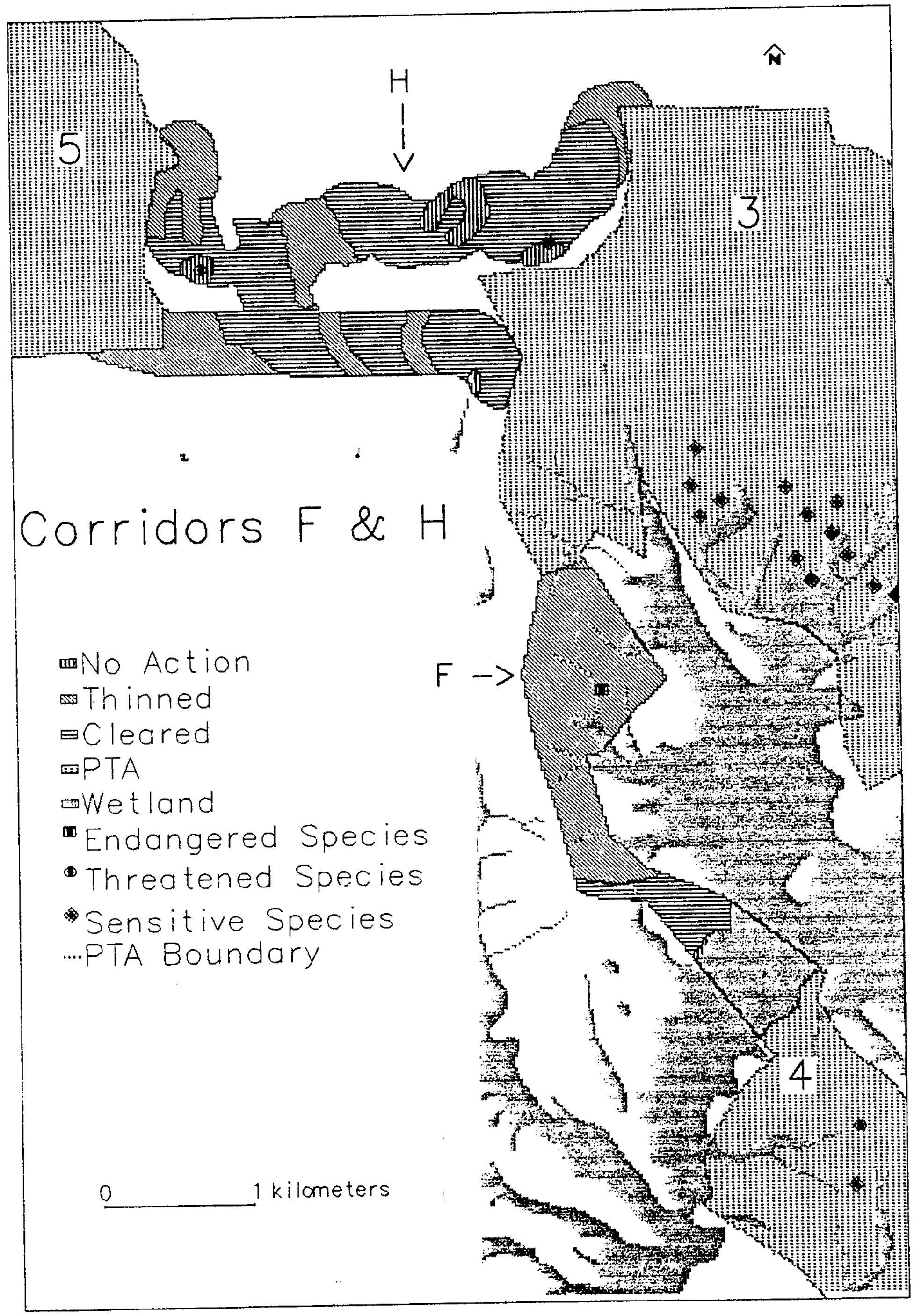

Figure 3-27 Conceptual Layout for Clearing and Thinning - Corridors F and H

Table 3-18

Tank Trail and Wetland Crossing in No Action Areas

	MLTCor	AcTTrl	#WLCros	MLWLCros	AcWLCros
PTA 1	n/a	n/a	12	n/a	13.54
PTA 2	n/a	n/a	31	n/a	41.41
PTA 3	n/a	n/a	5	n/a	3.95
PTA 4	n/a	n/a	13	n/a	16.41
PTA 5	n/a	n/a	0	n/a	0
PTA 6	n/a	n/a	18	n/a	17.4
Corridor A	3	624	2	0.3	3
Corridor B	2	522	0	0	0
Corridor C	10	2,024	12	2	13.24
Corridor D	2.5	557	0	0	0
Corridor E	2.5	271	2	0.2	2
Corridor F	2.3	422	8	0.6	4.94
Corridor G	3	794	8	1.3	11.27
Corridor H	4.8	757	0	0	0
Corridor I	0.9	170	1	0.1	0.3
Corridor J	1.3	199	0	0	0
Corridor K	1.6	289	2	0.4	2.77
Corridor L	0.9	146	0	0	0
Corridor M	1.7	302	0	0	0
ALT 1	22.7	4,942.6	78	4.1	91.22
ALT 2	19.8	3,998.3	72	2.4	89.35
ALT 3A	9.5	1,449.3	28	0.9	27.18
ALT 3B	16	2,556	49	1.3	47.65
Alt 4	n/a	n/a	n/a	n/a	n/a

MLTCor - Miles of Tank Corridor
AcTTrl - Acres of Tank Trails
#WLCros - Number of Wetland Crossings
MLWLCros - Miles of Wetland Crossings
AcWLCros - Acres of Wetland Crossings

Alternative 2 would provide new company team level maneuvering in and through PTAs 1, 2 and 4 and Corridors A, B, C, D and E (Figures 3-22, 3-23, 3-24, 3-25, 3-26 and 3-27; Tables 3-17 and 3-18). The number of training events and vehicles involved would be similar to the numbers in Alternative 1, but because of the reduced size of PTA 4 relative to PTA 3, training could only be conducted at the company team level. Therefore, the extent of use of the training areas would be similar to Alternative 1, and the same precautions regarding soil moisture would have to be followed, to prevent long-term disturbance to the soil.

Alternative 3A would provide for two company teams maneuvering in and through PTAs 3-5 and Corridors D, E, F and H (Figures 3-24, 3-27, 3-28 and 3-29 and Tables 3-17 and 3-18) on a similar schedule as in Alternatives 1 and 2. Because the combined size of these training areas is substantially less than PTAs 1-3, the intensity of use would be similar to battalion task forces using PTAs 1-3. Therefore, potential disturbance to the soils would be similar and the same mitigation measures would be followed. Due to the steep slopes in PTA 5, use would be limited to assembly along the ridges with associated movement along the ridges to the trails accessing PTA 3.

Alternative 3B would designate land for up to two multi-company task forces maneuvering in and through PTAs 3-6, and Corridors D, E, F, H, I, J, K, L and M (Figures 3-24, 3-27, 3-28, 3-29 and 3-30 and Tables 3-17 and 3-18) on a similar schedule as in the above alternatives. This alternative was developed as a direct result of a suggestion received during a public scoping meeting, to analyze an alternative that would meet Camp Shelby's training requirements, but limit training to an area north and west of Forest Service Road 303. Therefore, our guidelines of restricting proposed training areas by avoiding environmentally sensitive areas resulted in large blocks of "no action" areas when designating PTA 6 (see Figure 3-29). Thus, only 2,453 acres of the 9,175 designated are considered potentially suitable for tracked maneuvering (Table 1-3) because of either poor soils index, slopes greater than 10 percent, wetlands, or endangered species habitat (Table 3-17). Therefore, tracked vehicle maneuvers would be limited to a total training area of about 9,036 acres (Alternative 3B) as compared to as much as 17,459 acres available in Alternative 1 (Tables 1-3, 3-17 and Figure 3-29).

Alternative 4 proposes only the use of existing tracked vehicle maneuver areas. The upgrading of some existing facilities is included in Alternative 4 however, and will be discussed later in this section.

Tank ditch construction as described in Sections 1.2.1.3 and 1.2.8.1.2 will take place in the proposed engagement areas for Alternatives 1-4. Camp Shelby Range Regulations, dated October 1992, stipulate guidelines for excavation of anti-tank ditches and other dug-in positions. Annex G, Environmental Protection, Section X states in part; "No positions larger than a two-man fighting position may be dug-in without prior written approval from the Camp Shelby Facilities Engineer. Written requests must be submitted for approval to the Facilities Engineer no later than sixty (60) days prior to the proposed action." The regulations also indicate where dug-in positions can not be located (environmentally sensitive areas) and how dug-in positions will be restored after use. "These requirements will be

strictly enforced through inspection and the commander of the responsible unit will not be relieved of his/her site clean-up/rehab until all requirements have been met." These measures are inconvenient to the Army National Guard short-term but will ensure the integrity of the environment and training lands long-term.

Alternative 5 does not propose reconfigured tracked vehicle training areas and further proposes no off-road tracked vehicle maneuver training at all. Therefore, all existing tracked vehicle maneuver areas would go back to normal Forest Service management and future impact on soils, in the long term, would be similar to other forested lands managed by the U.S. Forest Service.

Alternative 6 proposes no action (described in Section 1.2 of this document) and will not have a significant effect on the soil resources at Camp Shelby. Background discussion of this issue is contained in the *Training Facilities EIS*, Weatherford McDade Ltd., 1991. All National Forest land now under SUP by Camp Shelby would return to Forest Service management, except those lands declared contaminated (i.e., impact area), and effects on the soils would then be similar to other local National Forest lands.

Automated Tank Table VIII (ATT-VIII): Construction of the Automated Tank Table (ATT) VIII on existing Range 45 (Alternatives 1-5) will have no significant impact on soils. Some measurable localized effects may be present during construction or operation of the facility, however, the existing range will need only relatively small improvements to upgrade the facility to a Tank Table VIII, particularly when compared to the development of an entirely new range in a presently unused area (Figure 3-20). These improvements are described in Section 1.3.1. In January 1993, Camp Shelby and U.S. Army Construction Engineering Research Laboratory (USACERL) contracted the Huntsville Division of the Corps of Engineers to design Range 45 for a Tank Table VIII using a Range Analysis System. In addition Mississippi Army National Guard (MSARNG) engineers and USACERL Agricultural engineers have estimated (ca. 50% design level) that the construction process and preconstruction sediment control structures will require approximately 175,000 cubic yards of soil to be cut and 156,500 cubic yards of fill material (Table 3-15). It is proposed that the fill soil be acquired from the high elevation area just adjacent to the STAB RUN (see Figure 3-20). This will also help create the needed lines of sight from stationary firing points and engagement points along the STAB RUN. Guidelines set by the Camp Shelby Erosion Control Plan will be followed during the construction and operation of ATT VIII and in conjunction with the ITAM program, no long-term effects on soils will be realized and no significant loss of soil resources will occur.

Prior to construction all stationary armored targets will have a one-foot ridge, a 2:1 sideslope and level diversions (Figures 3-31 and 3-32) placed downslope a distance adequate to avoid damage from off-target rounds. The purpose of these diversions is to eliminate the propagation of gullies forming in trenches caused by rounds fired below the target into the ground. No outlets are necessary because of the small area involved around each target.

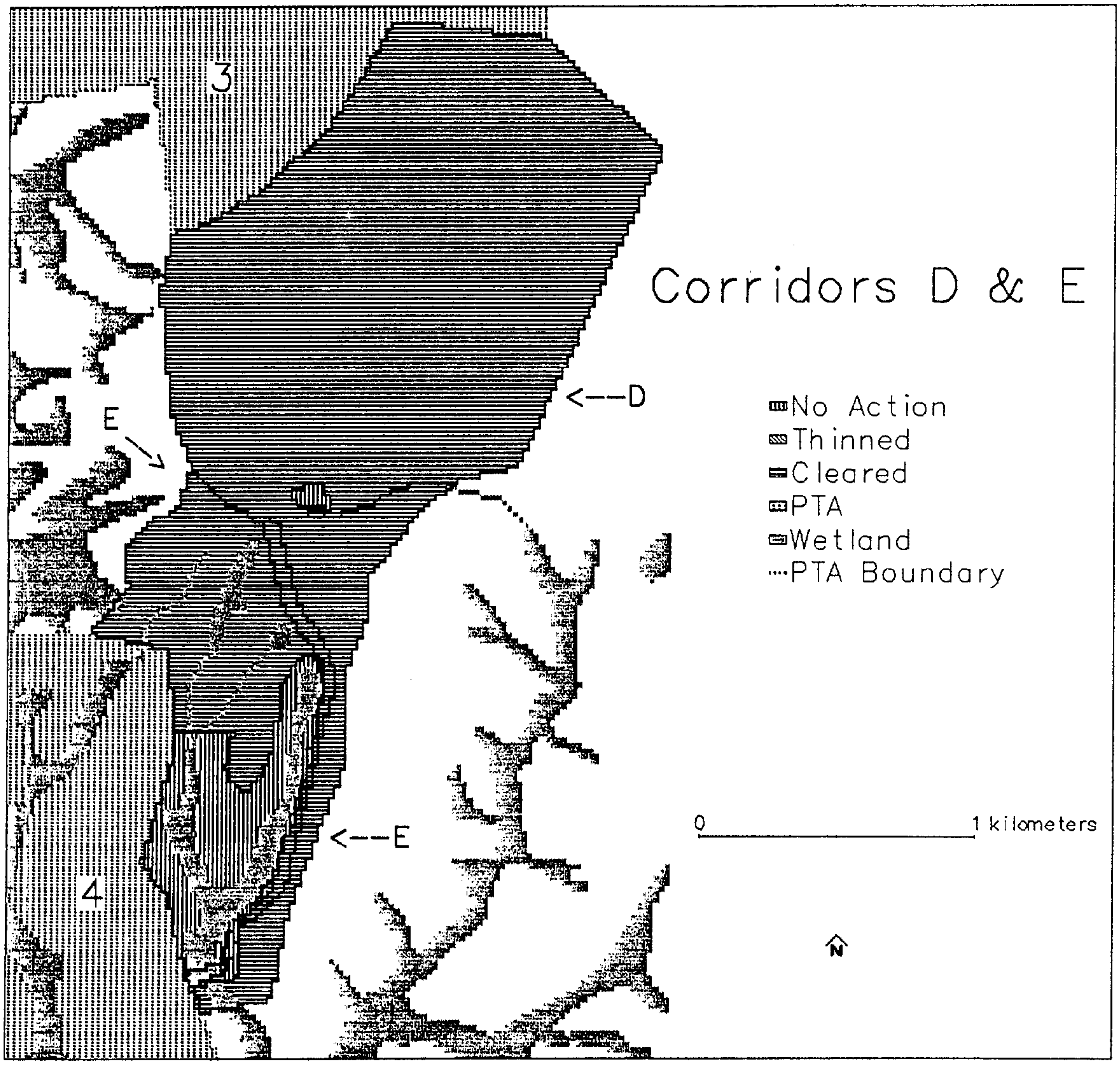

Figure 3-28 Conceptual Layout for Clearing and Thinning - Corridors D and E

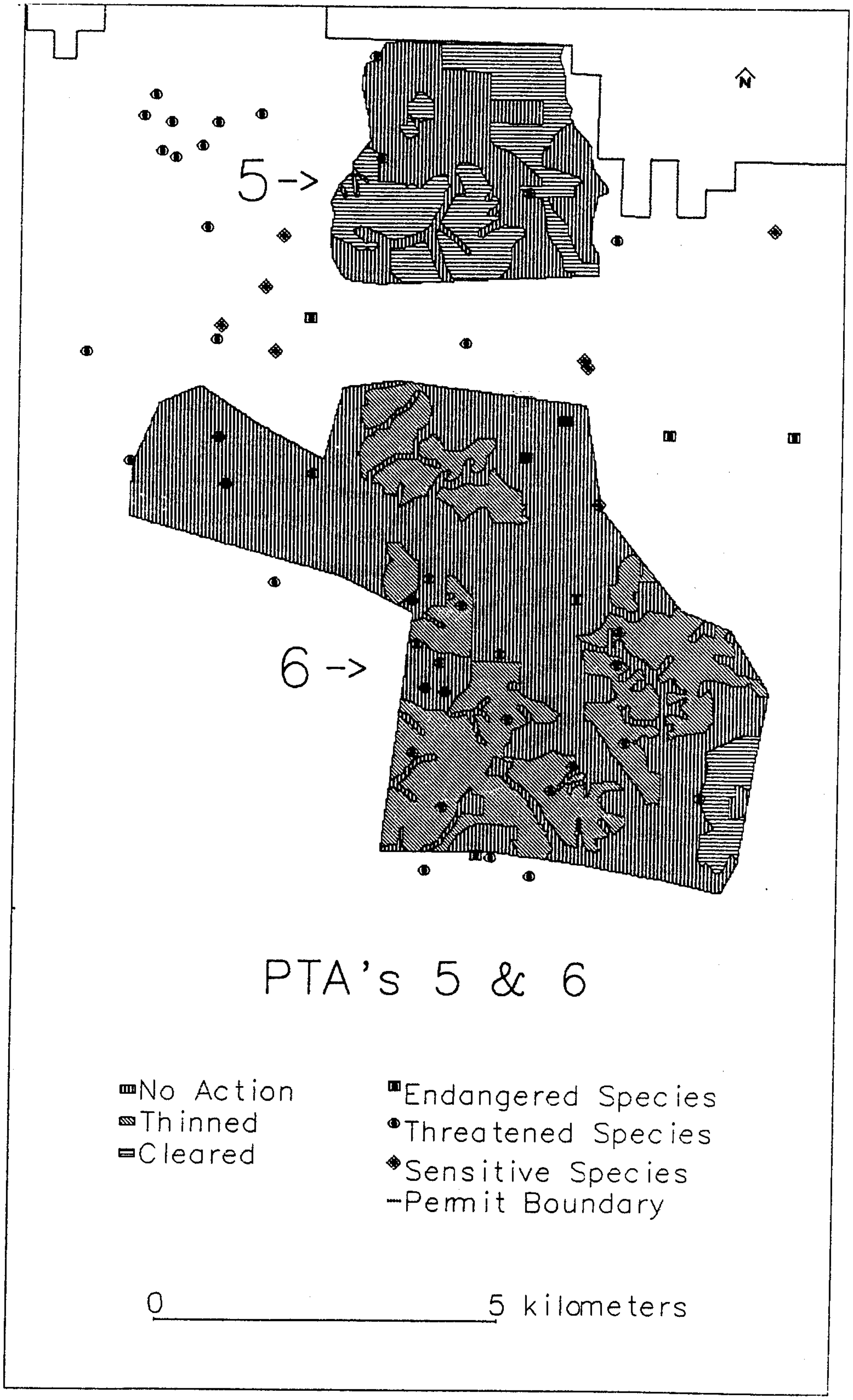

Figure 3-29 Conceptual Layout for Clearing and Thinning - PTA 5 and PTA 6

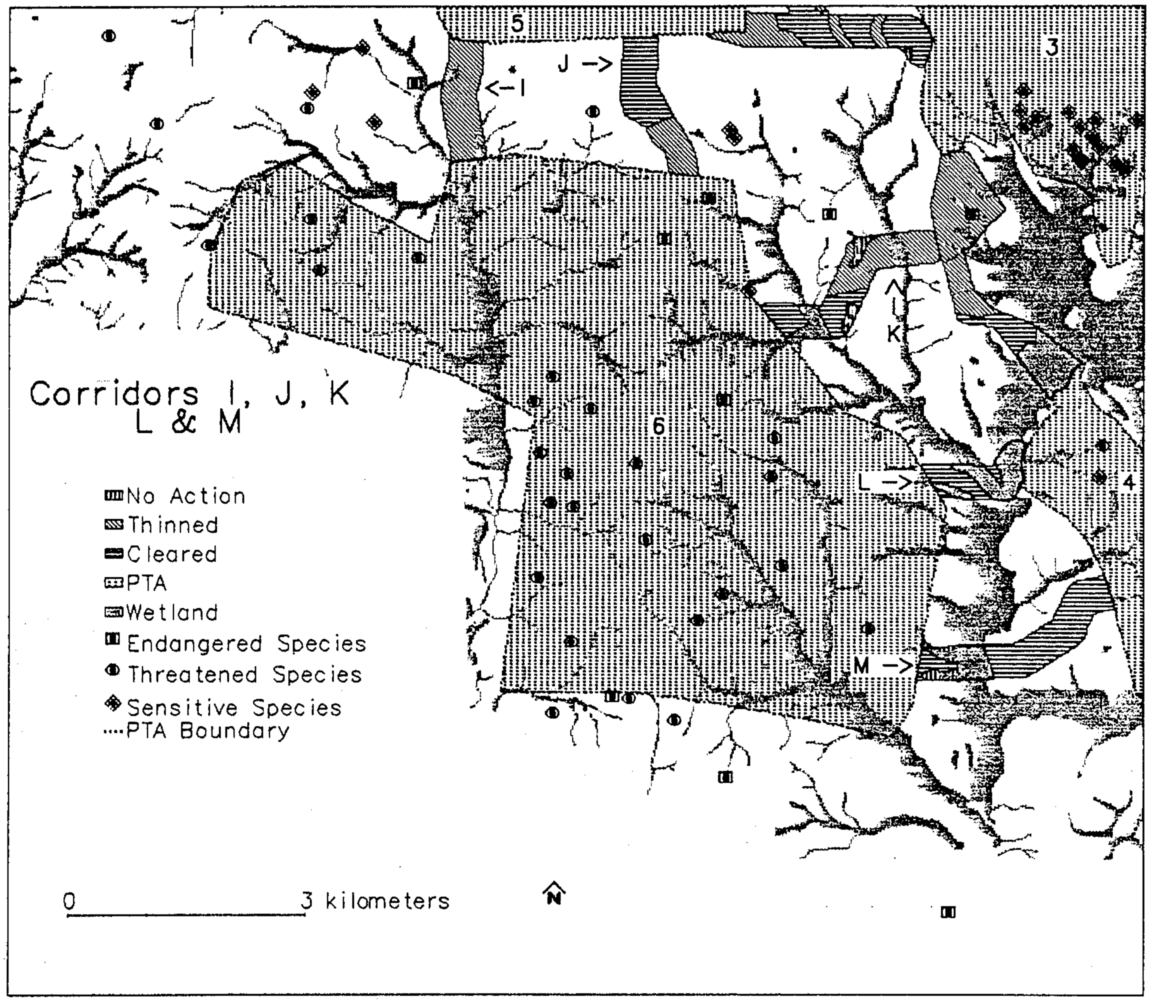

Figure 3-30 Conceptual Layout for Clearing and Thinning - Corridors I, J, K, L and M

Sediment trapping efficiency will be near 100 percent by the diversions. Similar diversions will be placed downslope from defilade positions prior to construction or reconstruction to trap any sediment during construction or operation of ATT VIII.

Multiple Purpose Range Complex-Heavy (MPRC-H): Construction of the proposed Multiple Purpose Range Complex-Heavy (MPRC-H) for Alternatives 1, 2, 3A, 3B, and 5, may cause measurable impact on soils. Therefore, guidelines set by the Erosion Control Plan for Camp Shelby will be followed during construction and operation o f the MPRC-H.

A primary and an alternate site have been proposed for construction of the MPRC-H (Figure 1-18). Due to environmental compatibility problems, the 1992 biological assessment of the effects on the gopher tortoise (Wester and Swing, 1992) recommended that the alternate site not be developed (see Section 3.3.2.5.2). The primary site has been identified (Figure 3-21 and Table 3-19). The primary advantage of upgrading an existing complex on Range 40 (the preferred site) is that two of the six lanes required for the MPRC-H could be constructed on the existing complex. The alternate site would require all new construction. The disadvantages of constructing the facility on the preferred site is that much of the soil has moderate to high erosion potential and moderate to low revegetation potential. In addition, the relief of the area is enough to make necessary considerable earth movement to create proper lines of sight for firing purposes (see Table 3-16), and the area contains 655 acres of wetlands and buffers. The alternate site has less low potential soils, less relief and less wetland and buffer (266 acres) but more threatened/endangered species habitat (over 500 acres. See Table 3-19 and Section 3.1.2.5.

In January 1993, Camp Shelby contracted the Huntsville Division of the Corps of Engineers to design the MPRC-H on existing Range 40 using a Range Analysis System. Engineers have estimated (ca. 35% design level) that the construction process and preconstruction sediment control structures will require approximately 314,000 cubic yards of fill soil for targets, roads and trails. The amount of cut has been minimized (to about 19,000 cubic yards) because the analysis system makes use of the existing terrain for target placement (Figure 3-33). General mitigation procedures regarding erosion management applicable to this project are discussed in Section 3.4.4.

Automated Tank Wash Facility: The Automated Tank Wash Facility is proposed for training mission Alternatives 1, 2, 3A, 3B, 4, and 5. A primary and alternate site have been designated for the facility (Figures 1-18, 1-23 and 3-38, and Table 3-19). Both sites will require construction-site earth-moving activities for preparation, however, much of the alternate site is already developed and used as a tank motor pool area. In either case it would be necessary to follow guidelines of the Erosion Control Plan for Camp Shelby during construction and operation of the tank wash facility.

Explosive Ordnance Disposal (EOD) Facility: The Explosive Ordnance Disposal Facility is proposed for training mission Alternatives 1, 2, 3A, 3B, 4, and 5. A primary and alternate site have been proposed for the facility (Figure 1-18 and 3-39, and Table 3-19). Also refer to Section 1.3.4 and 2.1.2.1 for a discussion on buffer areas; earth berms separating this impact area from other uses. Either site would occur on a McLaurin soil, 2-5 percent slope with no wetland categories in or near the sites. Based on construction criteria developed in 1990, there would be no significant impact on the soils of either site if constructed. However, erosion control measures outlined by the Erosion Control Plan for Camp Shelby would need to be followed, and the appropriate guidelines for the required burn pans followed to protect against soil contamination on either site.

Combined Arms Live Fire Exercise Assembly Area (CALFEX-AA): The CALFEX-AAs are proposed for training mission Alternatives 1, 2, 3A, 3B, 4, and 5. Four alternative sites have been designated for the three required assembly areas, plus a proposed site for the tactical operations center (TOC) (Figures 1-18 and 3-40 and Table 3-19). The preparation and operation of these facilities at any site is not expected to adversely affect the soils on the area. Some minor short-term soil loss effects resulting from this action are predictable, and are related to increased parking and turning of vehicles on the road shoulders. Road maintenance and revegetation plans will be developed under the Integrated Training Area Management (ITAM) process and the Camp Shelby Erosion Control Plan to minimize both short term and long term effects on soil loss and compaction.

Tactical Aviation Training Areas (TAAs): Tactical aviation training areas are proposed for training mission Alternatives 1-3B. Five possible "large" sites (Numbers 1, 5, 6, 9 and 10) and five potential "small" sites (Numbers 2-4, 7 and 8 and Figures 1-26, 3-41 and 3-42) have been proposed. Modification of three sites to provide a smaller area would involve maintaining all woody vegetation in a 300 by 300 meter (about 22 acres) to a 500 by 500 meter area (about 60 acres) in a cleared condition. The fourth site would be maintained as cleared up to 800 by 800 meters (about 150 acres) provide a large, or battalion-size area. All 10 sites were evaluated for possible use as small sites but only 5 of the 10 were evaluated for possible use as large sites because of limited size. In addition, earth moving would be required to obtain a slope of 0-6 percent, as the areas are now between 0-8 percent. Based on the detailed environment of each of the 10 sites, sites 1, 3, 4, and 8 are best suited for use in terms of least conflict with environmental constraints. Current digital elevation data are not detailed enough to estimate the amount of earth movement needed to prepare any of the 10 sites. Site specific analyses will be done prior to construction and the information will be used along with environmental data to determine the best suited sites. In any case guidelines set by the Erosion Control Plan for Camp Shelby should be strictly followed to ensure no long-term impact in the areas of the chosen sites.

3.3.1.4 Prediction of Soil Loss and Sedimentation

The soil erosion and sedimentation prediction analyses discussed in Section 3.1.1.3.4 were used to predict soil losses associated with the proposed alternatives. This analysis used training scenarios provided by the MSARNG. The *C* (land cover) factor, which is a constant used within the Revised Universal Soil Loss Equation (RUSLE), was calculated for undisturbed and disturbed areas using the training/rehabilitation schedule for Camp Shelby and the annual average distribution of rainfall energy (see Table 3-20). Those *C*-factors were used in the analyses to represent the influence of canopy and ground cover changes due to training frequency, intensity and rehabilitation status. As noted in Section 3.1.1.3.4, PTA 1 represents a predominantly forested area relatively undisturbed by current military activities.

Using PTA 1, alone, as an example, a series of analyses were prepared using the soil loss and deposition model. For these analyses, the following sets of conditions were assumed: 1) Undisturbed; 2) Cleared/thinned, no revegetation; 3) Cleared/thinned *with* revegetation but no maneuver; 4) Cleared/thinned, with initial revegetation and following maneuver use; and 5) Cleared/thinned, with maneuver, with *both* initial revegetation *and* annual repair and maintenance. The relationship among these conditions is approximately as shown below.

Undisturbed	Cleared	Revegetated	Maneuver	Maneuver *with* repair
0.04	0.74	0.11	0.96	0.35

Several conclusions may be related to these calculations. The most important is that revegetation after initial clearing decreases potential soil losses to one-seventh the level without this mitigation. Another is that, even with annual repair and revegetation, soil losses are still greater than the revegetated, but not trained, situation. Further analyses examined the effects of adding 100 foot buffers around all wetlands and stream channels as well as restricting tracked vehicle maneuver on slopes greater than 10 percent. Alternatives 1, 2, 3A, 3B, and 4 are compared and related, following application of these mitigation procedures, in Section 3.4.2.

3.3.1.5 Surface Water

Alternatives 1-3B require new maneuver areas that must have the timber either thinned or cleared in part as described in Section 1.2. Either method of timber removal would result in some increased water yield (overland flow) on the cleared or thinned sites. However, the planned wetland buffer areas in conjunction with no-action areas and catchment structures are sufficient to slow the increased water yields so that sediments of sand and silt size would be deposited before reaching the wetlands and streams. 100-foot wide buffer strips will be utilized in all wetland areas to protect the wetlands from sediment of sand size. Current guidelines indicate that a 33-foot buffer width would be sufficient in areas with overland slopes of up to 10 percent, for areas with slopes greater than 10 percent it is recommended to use a buffer measuring 33 feet plus 1.5 times percent slope (Swift, 1986; NCASI,1992).

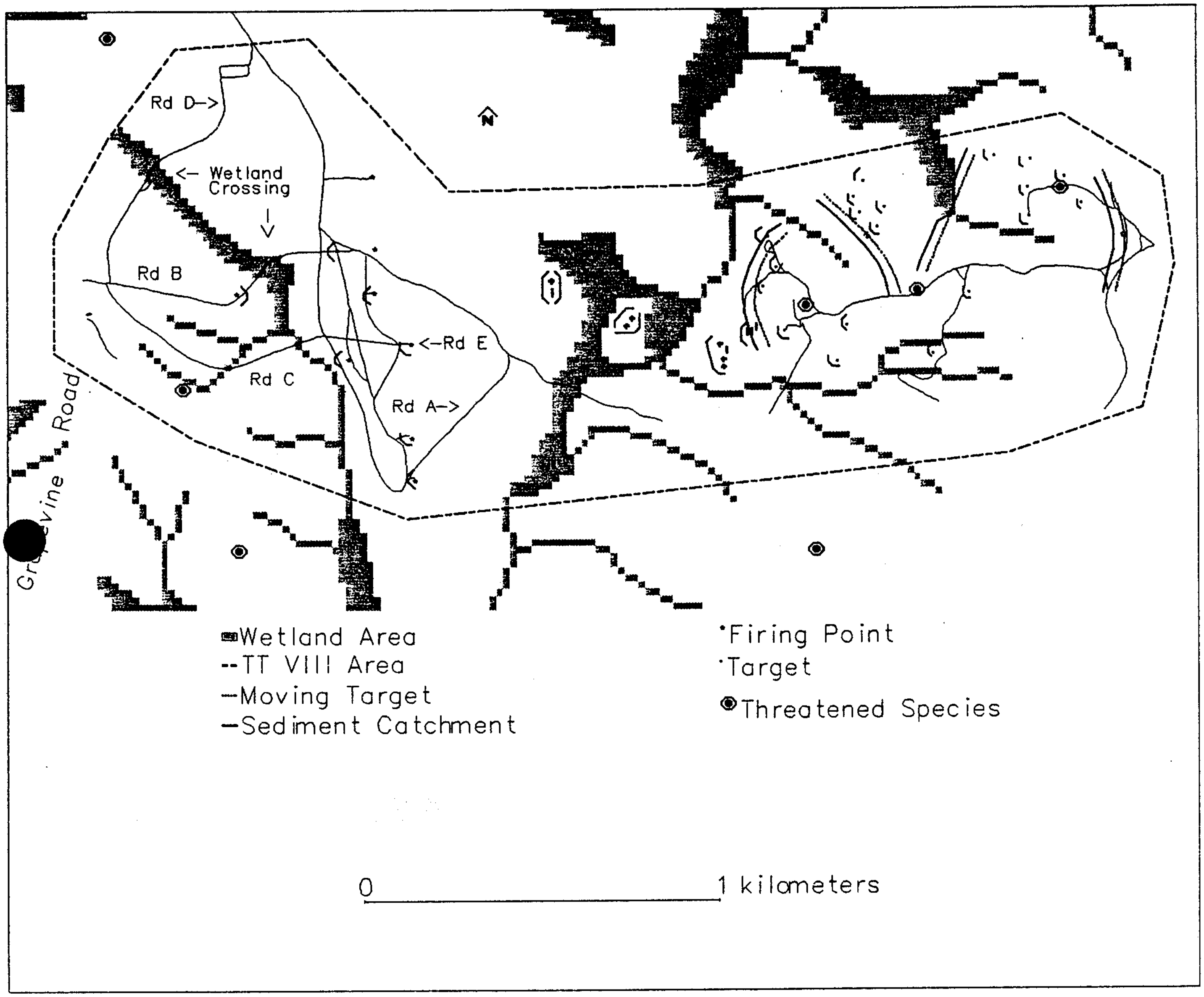

Figure 3-31 Proposed Environmental Protection Measures ATT VIII

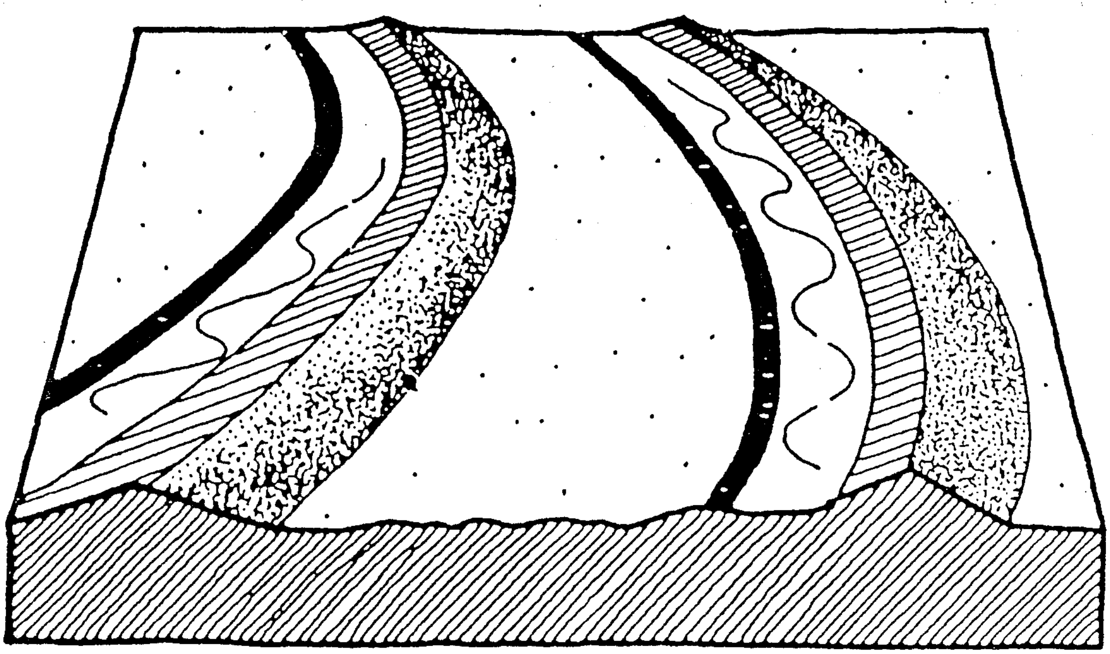

Figure 3-32 Cross Section of Level Terrace

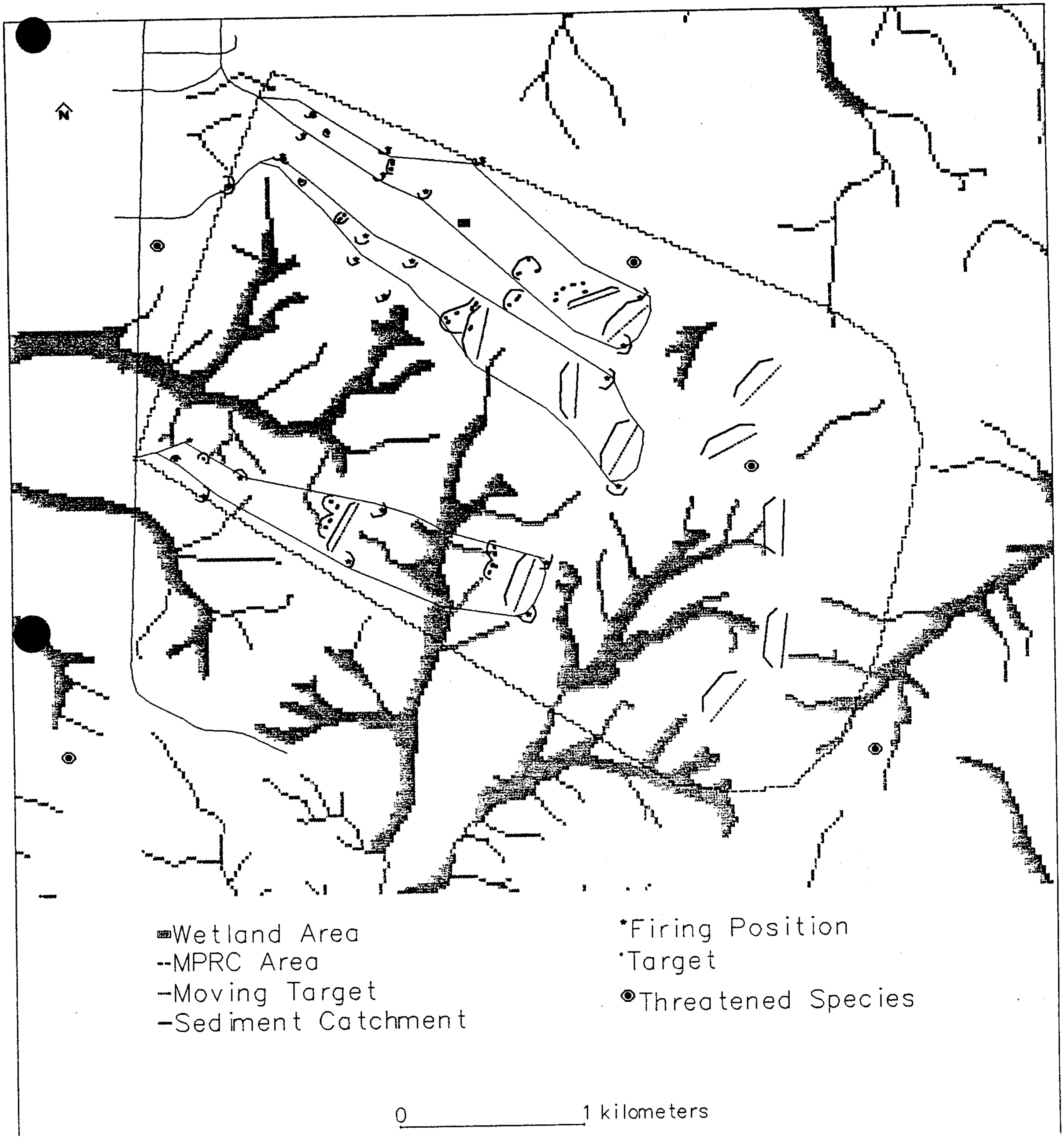

Figure 3-33 Proposed Environmental Protection Measures MPRC-H

Table 3-19
Net/Gross Acres for Training Facilities

Area	Gross Acres	Wetlands+buf	RCW Colony	Gopher+buf	GopherSoil	NETAREAnec
Tank Table 8	720	199	0	120*	0	495
Primary MPRC	2531	626	0	204*	33	1876
Alternate MPRC	1789	237	0	223	66	1272
Tank Wash 1	69	0	0	0	0	69
Tank Wash 2	89	4	0	0	0	85
EOD 1	31	0	0	0	0	31
EOD 2	31	0	0	11	0	20
CALFEX #1	8	0	0	0	0	8
CALFEX #2	6	0	0	0	0	6
CALFEX #3	4	1	0	0	0	3
CALFEX #4	5	0	0	0	0	5
CALFEX TOC	10	0	0	0	0	10

Wetlands+buf = Wetlands w/100ft. Buffer
RCW Colony = Red Cockaded Woodpecker Colony Sites w/Buffer
Gopher+buf = Gopher Tortoise Colony Sites w/Buffer
GopherSoil = Acres of Priority Soils
NETAREAnec = Net Area Available for Training Activities which has No Environmental Constraints

MPRC = Multiple Purpose Range Complex
EOD = Explosive Ordnance Disposal
CALFEX = Combined Live Fire Exercise Assembly Areas

* - The biological opinion for Gopher Tortoise states that colonies now present in the Tank Table VIII upgrade area and the primary MPRC-H site can be relocated, thus these areas are not considered environmental constraints and are included in the NETAREAnec column.

There are very few slopes on Camp Shelby greater than 44 percent; therefore, the more conservative and easier to apply 100-foot width will be used throughout to afford greater protection. As discussed above, areas over 10 percent slope are excluded from tracked vehicle maneuver development, so the proposed uniform 100-foot buffer is both adequate overall and more easily applied than a variable one.

Another impact which may occur will be associated with stream discharge. Changes in the flow regimes of streams in areas where timber is thinned and clear cut will be noticeable as long as these areas are maintained in an open condition supporting training. Stream hydrographs will reflect more intense, short duration peak flows (greater overland flow) and lower "low" flows (reduced subsurface flow). Increased water yield, especially during peak

flows produced during storm events, has the potential to alter stream channel morphology resulting in channel widening, bank cutting, and shallower stream depths.

During construction, the ATT VIII (see Figure 3-31) has the potential to result in measurable adverse effects on surface waters associated with the Range 45 area prior to mitigation. In the absence of mitigation, soil erosion during the construction and operation of the range would be inevitable during measurable rainfall events. Extensive mitigation procedures *are* planned (see Section 3.4.4 for a general presentation).

3.3.1.5.1 Wetlands

Training mission Alternative 1 involves two task forces maneuvering in and through proposed training areas 1, 2 and 3 and associated corridors A, B, C, D and G (Figure 1-12). All six proposed facilities will also be constructed.

Proposed training areas and associated corridors for Alternative 1 comprise a gross area of 35,512 acres. Of this total area 8,401 acres are designated wetlands and their associated 100-foot buffers (Figures 3-34, 3-35 and 3-36 and Table 3-17). All wetland and associated buffers will be physically designated as "OFF LIMITS" by visible markings. Troops training at Camp Shelby will be provided with environmental awareness education so that they will be able to recognize environmental constraints and concerns. The effectiveness of this process will be continually monitored. Detailed mitigation procedures are described in Section 3.4.

Corridors A, B, C, D, F, and G, associated with Alternative 1 (Figure 1-12) comprise 4,917 acres and will contain 22.7 miles of improved trail ten meters wide (see Figures 3-25, 3-26 and 3-27). These trails cross 22 wetland areas comprising a total of 32 acres of wetland crossings (see Table 3-18). There are no stream and associated wetland crossings contained in the corridors that require a separate Corps of Engineers bridge permit. However, the access trail and associated corridor east of state Highway 29 from PTA 3 to the other training areas will have to be constructed and will cross three major streams and associated wetlands that may require Section 401 (vegetation clearing) and Section 404 (wetland clearing or fill) permits (see Figure 3-24). Required permits will be defined and requested at the time final development plans are prepared. The number of wetland crossings *within* each PTA can not be exactly determined at this time but will be determined at the time of site specific design of the PTAs. The number of crossings will be determined as a minimum needed for a typical maneuver scenario (see Section 1.2.7). All wetland crossings will be designed, constructed and used as proposed in Section 3.4.3.3 of this document. These crossings will maintain the integrity of the wetland and result in a minimum loss of wetlands. Total minimum estimated loss of wetlands is 91 acres.

Table 3-20 Camp Shelby, Mississippi

Rainfall Erosivity Distribution and Training effects on C Factor

Note: Rf is fractional R factor, Cum indicates cumulative							Intensive Traffic		Minor Traffic	
Month	Day	Cum Rf	Rf	Cum R	R	Activity	C Factor	RfxC	C Factor	RfxC
Jan	1	0		0.0	0.0	Rest	0.0011	0.00002	0.0011	0.00002
	10	0.02	0.02	9.5	9.5	Rest	0.0010	0.00001	0.001	0.00001
	20	0.03	0.01	14.3	4.8	Weekend	0.0020	0.00004	0.0012	0.00002
Feb	1	0.05	0.02	23.8	9.5	Weekend	0.0030	0.00006	0.0014	0.00003
	10	0.07	0.02	33.3	9.5	Weekend	0.0040	0.00008	0.0016	0.00003
	20	0.09	0.02	42.8	9.5	Weekend	0.0050	0.00010	0.0018	0.00004
Mar	1	0.11	0.02	52.3	9.5	Weekend	0.0060	0.00012	0.002	0.00004
	10	0.13	0.02	61.8	9.5	Weekend	0.0070	0.00021	0.0022	0.00007
	20	0.16	0.03	76.0	14.3	Weekend	0.0080	0.00016	0.0024	0.00005
Apr	1	0.18	0.02	85.5	9.5	Weekend	0.0090	0.00027	0.0026	0.00008
	10	0.21	0.03	99.8	14.3	Weekend	0.0100	0.00030	0.0028	0.00008
	20	0.24	0.03	114.0	14.3	Weekend	0.0110	0.00033	0.003	0.00009
May	1	0.27	0.03	128.3	14.3	Annual	0.0300	0.00090	0.005	0.00015
	10	0.3	0.03	142.5	14.3	Annual	0.0500	0.00150	0.007	0.00021
	20	0.33	0.03	156.8	14.3	Annual	0.0700	0.00140	0.009	0.00018
Jun	1	0.35	0.02	166.3	9.5	Annual	0.0900	0.00270	0.01	0.00030
	10	0.38	0.03	180.5	14.3	Annual	0.1100	0.00330	0.02	0.00060
	20	0.41	0.03	194.8	14.3	Annual	0.1300	0.00520	0.03	0.00120
Jul	1	0.45	0.04	213.8	19.0	Annual	0.1300	0.00520	0.04	0.00160
	10	0.49	0.04	232.8	19.0	Annual	0.1300	0.00650	0.05	0.00250
	20	0.54	0.05	256.5	23.8	Annual	0.1300	0.00780	0.06	0.00360
Aug	1	0.6	0.06	285.0	28.5	Annual	0.1300	0.00650	0.07	0.00350
	10	0.65	0.05	308.8	23.8	Wknd/Rehab	0.1122	0.00561	0.0678	0.00339
	20	0.7	0.05	332.5	23.8	Wknd/Rehab	0.1022	0.00409	0.0633	0.00253
Sep	1	0.74	0.04	351.5	19.0	Wknd/Rehab	0.0900	0.00360	0.0567	0.00227
	10	0.78	0.04	370.5	19.0	Wknd/Rehab	0.0777	0.00233	0.0499	0.00150
	20	0.81	0.03	384.8	14.3	Wknd/Rehab	0.0651	0.00130	0.0429	0.00086
Oct	1	0.83	0.02	394.3	9.5	Wknd/Rehab	0.0523	0.00105	0.0357	0.00071
	10	0.85	0.02	403.8	9.5	Wknd/Rehab	0.0393	0.00079	0.0282	0.00056
	20	0.87	0.02	413.3	9.5	Wknd/Rehab	0.0262	0.00026	0.0207	0.00021
Nov	1	0.88	0.01	418.0	4.8	Rest	0.0130	0.00026	0.0130	0.00026
	10	0.9	0.02	427.5	9.5	Rest	0.0075	0.00008	0.0075	0.00008
	20	0.91	0.01	432.3	4.8	Rest	0.0043	0.00009	0.0043	0.00009
Dec	1	0.93	0.02	441.8	9.5	Rest	0.0033	0.00007	0.0033	0.00007
	10	0.95	0.02	451.3	9.5	Rest	0.0023	0.00007	0.0023	0.00007
	20	0.98	0.03	465.5	14.3	Rest	0.0016	0.00003	0.0016	0.00003
Jan	1	1	0.02	475.0	9.5					
						Weighted C:		0.06		0.03

Alternative 2 proposes use of PTAs 1, 2, and 4, and associated corridors C, D, and E (see Figures 1-13, 3-25, 3-26, 3-28, 3-34, 3-35 and 3-36). The major difference in Alternatives 1 and 2 is the size of PTA 4 and its location as compared to PTA 3 in Alternative 1. Therefore, the major stream crossings from the west side of PTA 3 would be avoided. Corridors C, D, and E, associated with Alternative 2 comprise 3,983 acres and will contain 19.8 miles of improved trail. These trails cross 16 wetland areas comprising a total of 18 acres of wetland crossings (see Table 3-18). Estimated wetlands loss for Alternative 2 is 86 acres.

Alternative 3A proposes company team maneuver areas with two company teams maneuvering in and through PTAs 3, 4 and 5 and associated corridors D, E, F, and H (see Figures 1-14, 3-27, 3-28, 3-36 and 3-37). As designated, PTAs 3-5 comprise 9,581 gross acres (see Table 3-17). Wetlands and the associated 100 foot buffers comprise 1,712 acres. Corridors D, E, F, and H, associated with Alternative 3A comprise 2,010 acres and will contain 12 miles of improved trail. These trails cross 10 wetland areas comprising a total of 6.8 acres of wetland crossings (see Table 3-18). One major stream crossing from the west side of PTA 3 would be constructed as in Alternative 1. An estimated 27 acres of wetlands will be affected in this alternative.

Alternative 3B proposes multi-company task force maneuver areas with a multi-company task force maneuvering in and through PTAs 3, 4, 5, and 6 and associated corridors D, E, F, H, I, J, K, L, and M (see Figures 1-15, 3-26, 3-27, 3-29, 3-35 and 3-36). PTA 6 is 9,175 acres in size with 2,227 acres of wetlands and associated buffers. The corridors comprise 3,116 acres and will contain 18 miles of improved trail. These trails cross 13 wetland areas comprising a total of 9.9 acres of wetland crossings (see Table 3-18). One major stream crossing from the west side of PTA 3 would be constructed as in Alternative 1. Total wetland loss is estimated at 58 acres.

Based on the above discussion there will be a small loss of wetlands of approximately 27 to 91 acres, if Alternative 1, 2, 3A, or 3B is implemented (Table 3-18). In the absence of adequate maintenance and mitigation, there is potential for soil loss from these crossings and subsequent siltation of adjacent wetlands. Several potential mitigation methods are proposed to compensate for the small loss of wetlands associated with each alternative. These mitigation methods are described in detail in Section 3.4.5.5.

Alternatives 4-6 do not propose reconfigured maneuver areas, but Alternative 4 will incorporate the off-limits masking for wetlands as described above. The existing tracked vehicle maneuver areas will also be managed under the ITAM program (Appendix G).

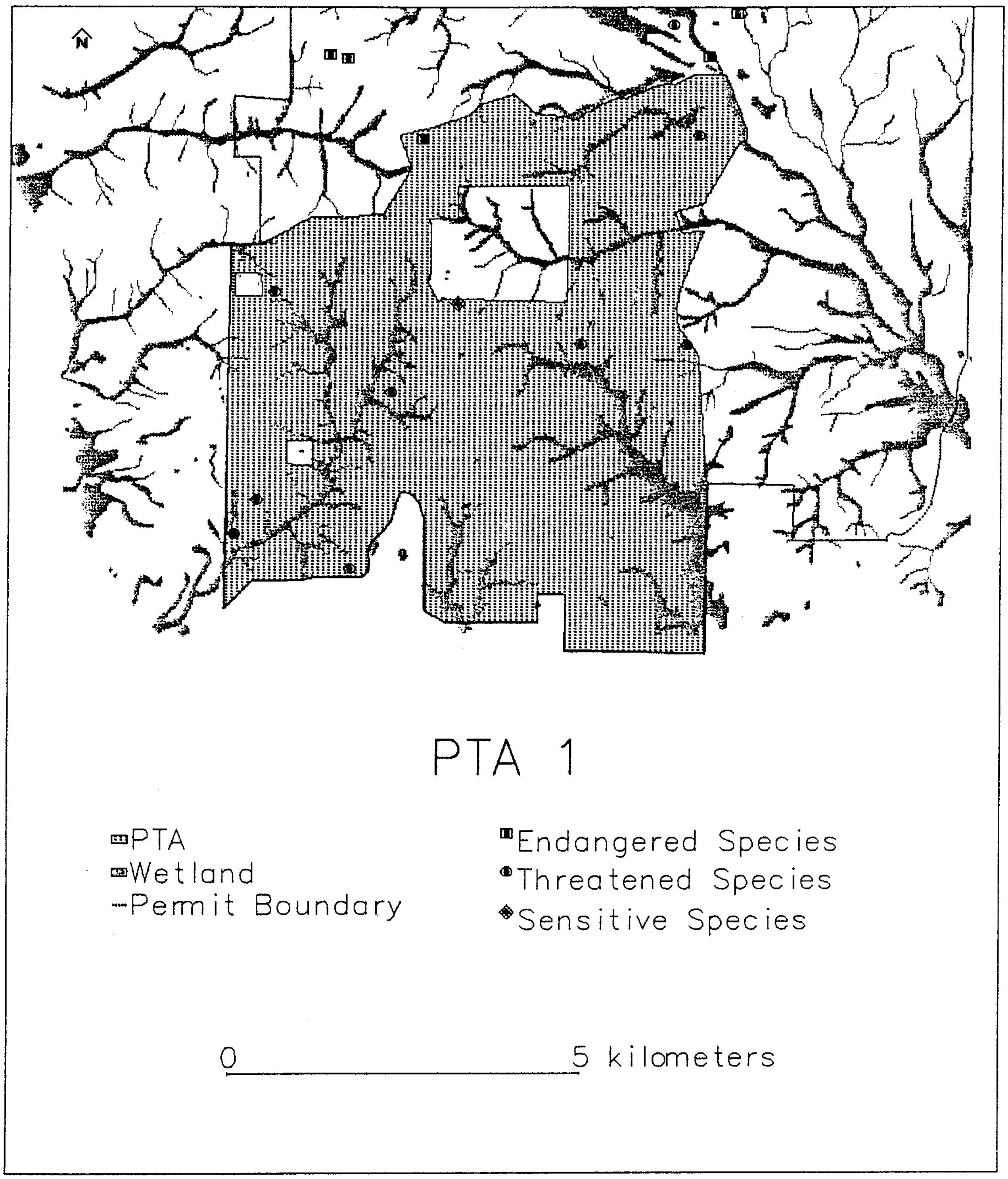

Figure 3-34 Detailed Environment of PTA 1

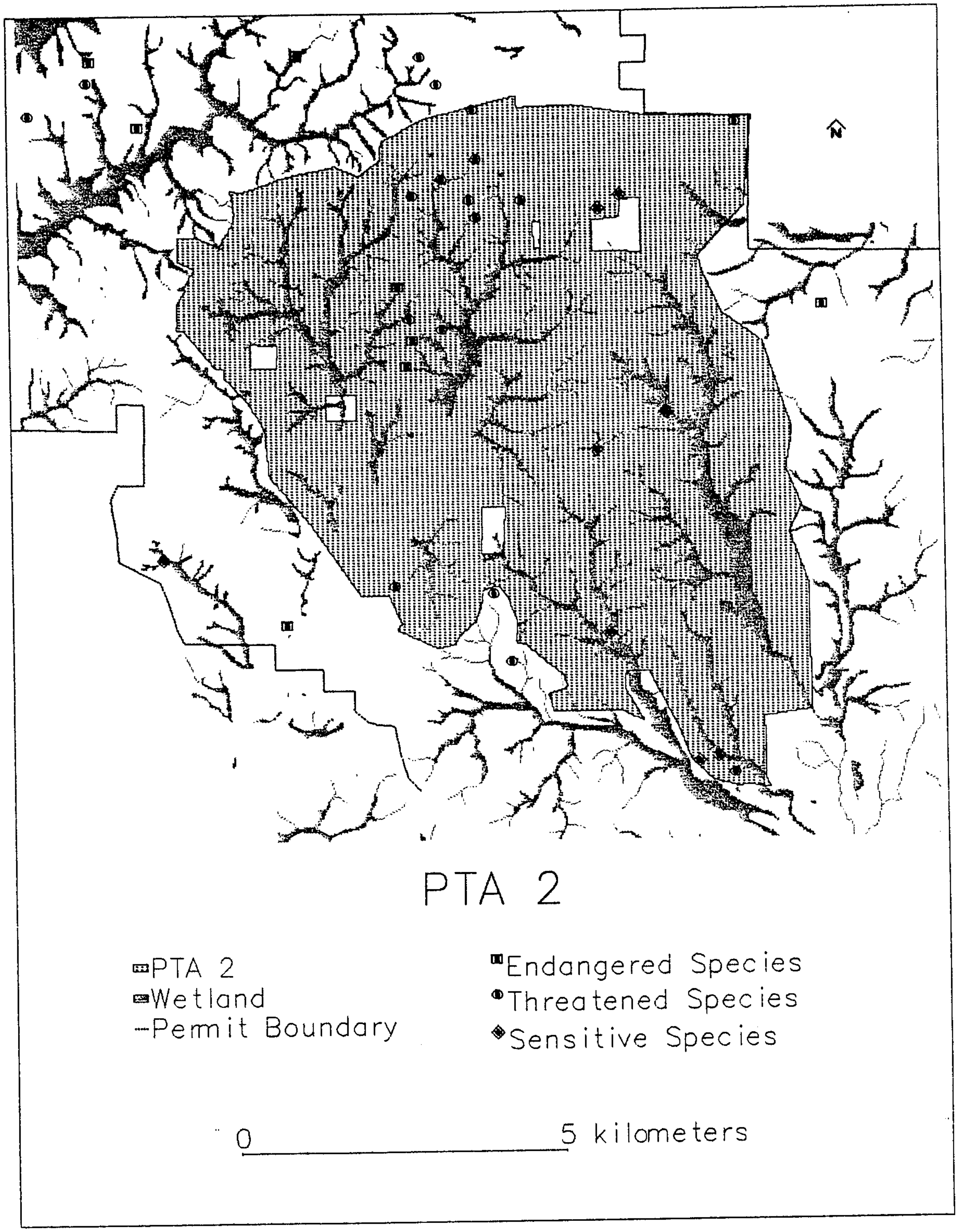

Figure 3-35 Detailed Environment of PTA 2

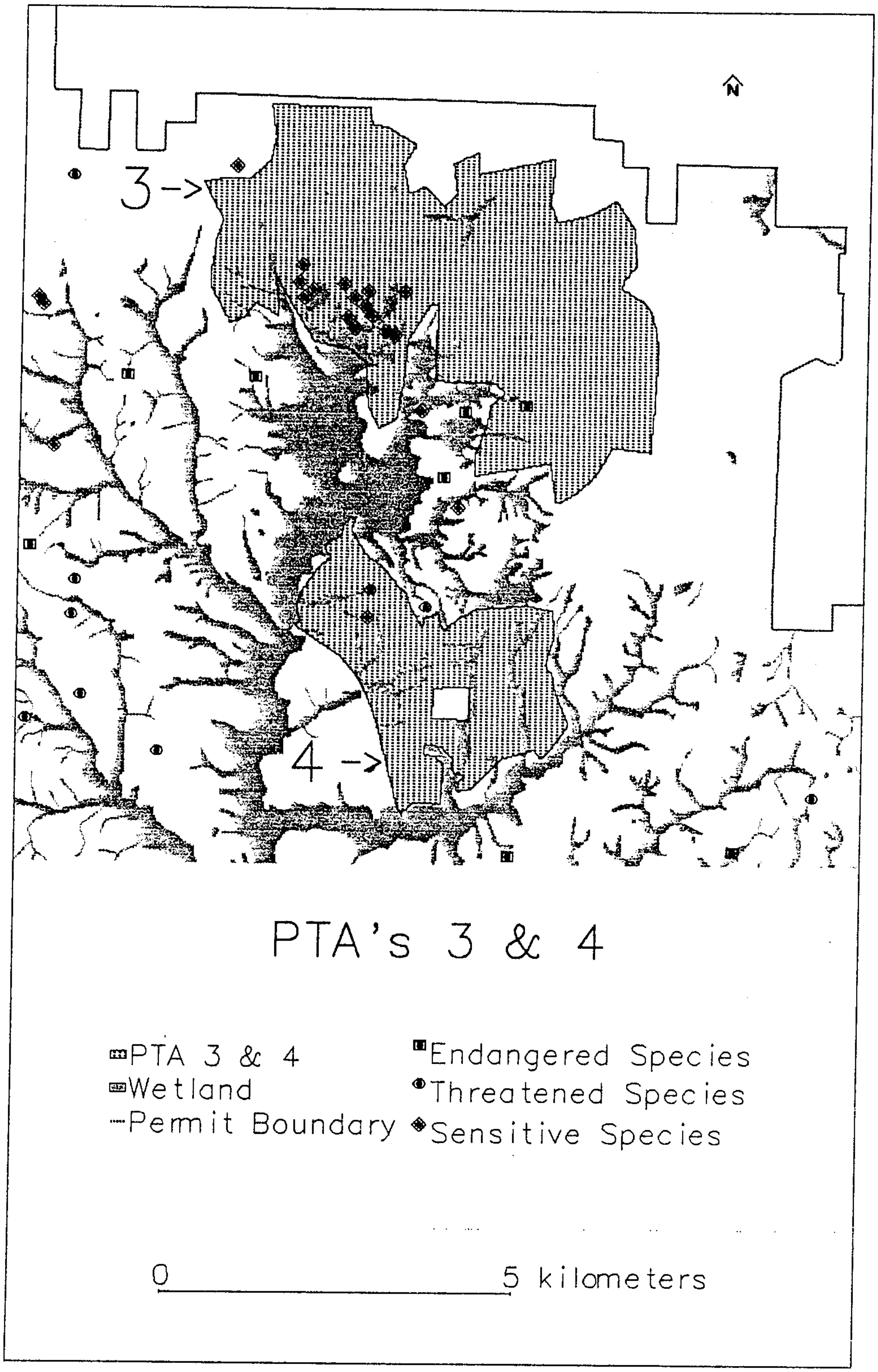

Figure 3-36 Detailed Environment of PTA 3 and PTA 4

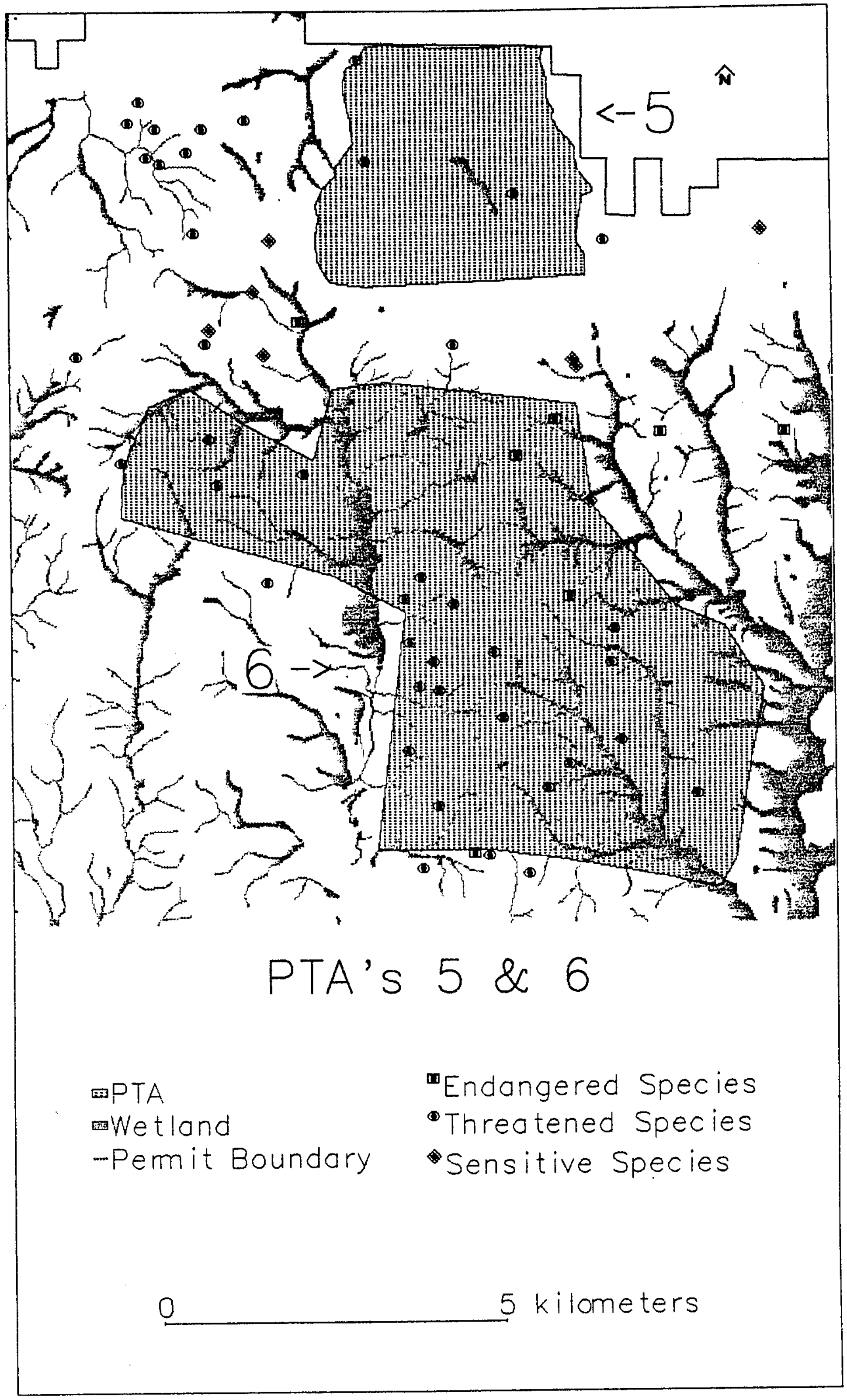

Figure 3-37 Detailed Environment of PTA 5 and PTA 6

Automated Tank Table VIII (ATT-VIII): Automated Tank Table VIII is proposed for Alternatives 1-5. This discussion serves for all five alternatives. The required placement of 44 stationary personnel targets (SPTs) will require approximately 10 acres of wetland vegetation be hand cut and maintained without chemicals to allow the needed line-of-sight between the firing points and the targets. There are approximately 30,000 seedlings, saplings and trees within this area and approximately 3,000 are 6 inches in diameter at breast height (dbh) or more (Table 3-15). The removal of these trees will cause a change in the wetland plant community.

Each of the 44 SPTs to be constructed will be located above the 200-foot elevation line at their base. A 1 percent grade, a two-foot ridge and a 3:2 sideslope diversion (see Figure 3-32) will be constructed between the personnel target area and the wetland area. A silt fence will be installed at each of these locations prior to initiation of construction. These diversions will outlet through either a grass filter or buffer area, or in addition a sedimentation basin. Their proposed locations are shown in Figure 3-31. Periodic inspection, during and immediately after construction, of the sediment trapped in the filter will dictate if a sedimentation basin is required. Short service trails (<300m) leading from an established road to the SPTs will be created above the 200-foot elevation level to ensure minimal direct impact on the wetlands down slope. Guidelines set by the Camp Shelby Erosion Control program will be followed during construction and maintenance of the trails.

New road construction and improvement of existing roads will require three wetland crossings comprising about one acre of wetland (see Figure 3-31 and Table 3-15). Power and signal cable will be on overhead poles in areas outside of the line-of-fire zones. Upon entering the target array areas, these cables will be buried in the road shoulder. In addition to these major supply cables, smaller, buried signal cable will be carried to several target arrays for activation and scoring purposes. Guidelines discussed above will be followed in developing the crossings and routing the signal cable.

Multiple Purpose Range Complex-Heavy (MPRC-H): The MPRC-H is proposed for Alternatives 1, 2, 3A, 3B, and 5. This discussion serves for all action alternatives. The primary MPRC-H site encompasses approximately 626 acres of wetland and buffer (Figure 3-21 and Table 3-19). The alternate MPRC-H site encompasses approximately 266 acres of wetland and buffer (see Table 3-19). Therefore, potential for environmental impacts does exist.

Automated Tank Wash Facility: The tank wash is proposed for Alternatives 1-5. The tank wash facility is to be located on State lands and will have no impact on wetland areas at either the primary or alternate sites (Figure 3-38 and Table 3-19). The 4.2 acres of wetland buffer in the proposed alternative site will be avoided and protected.

Explosive Ordnance Disposal (EOD) Facility: The EOD facility is proposed for Alternatives 1-5. Preferred and alternative sites have been proposed on State lands. Construction of the site requires a 200 x 200-foot area to be cleared of all vegetation. Some soil movement may occur but little is expected at either site because the sites are level. The cleared area at either

site is at least 300 meters from any wetland area; therefore, the facility will have no impact on wetland areas at either the primary or alternate site (Figure 3-39 and Table 3-19).

Combined Live Fire Exercise Assembly Areas (CALFEX-AA): Four potential areas have been identified (Figure 3-40). Each site will require approximately 25 acres of an existing trail be upgraded to approximately 16 feet wide and 1/2 mile long. The areas will be graveled, and engineered with necessary culverts, lead-off ditches and erosion control measures. The areas contain no wetlands (see Table 3-19); therefore, there will be no measurable impact.

Wetlands will be excluded from use, and will be crossed on improved crossings or bridges as required. Areas of erosive soil will be avoided, tortoise colonies will be marked off-limits, priority soils avoided wherever possible and the Camp Shelby Erosion Control Plan and ITAM management procedures will be implemented throughout the area. There will be no measurable impact on wetlands.

Tactical Aviation Training Areas (TAAs): The tactical aviation areas are proposed for Alternatives 1-3B (See Figure 1-26). An attempt was made to restrict the TAAs to soils with a moderate to high index value and to minimize conflicts with wetlands and TE&S species habitat. Analyses of the four preferred and six alternate sites indicates that sites 1, 3, 4, and 8 entail the least conflict with environmental constraints including wetlands (Figures 3-41 A&B and 3-42 A&B and Table 3-19). Specific site analysis prior to construction will be required to assess the effects of leveling the selected areas to a slope of 6 percent. Guidelines established by the Erosion Control Plan will be followed during the construction process to ensure protection of associated wetlands.

3.3.1.5.2 Nutrient Loss and Transfer

Studies performed for U.S. Construction Engineering Research Laboratory (USACERL) in 1992 indicated that the proposed techniques for fertilization of newly-revegetated field areas can have the potential to release nutrients, especially nitrogen, into runoff water (see Appendix S). It is agreed that such losses of nutrients may have adverse effects on certain types of vegetation, especially those unique, acid-soil wetland communities known as pitcher plant bogs (see Sections 3.1.2.5 and 3.1.2.6).

The revegetation of areas where the soil cover has been disturbed by training exercises is part of Camp Shelby's erosion control program. Such replanting requires the application of plant nutrients (Aldrich, 1980; Fedkiw, 1991). Through leaching and runoff, these nutrients could migrate into wetlands and water courses. Especially in the case of pitcher plant bogs and flats, such migration in sufficient quantity could drastically alter the composition of plant species and, among other things, could eventually make such bogs and flats unsuitable for the endemic Camp Shelby burrowing crayfish (Eleuterius, et al, 1969; Harper 1971; Bergh 1979; Silverton 1980).

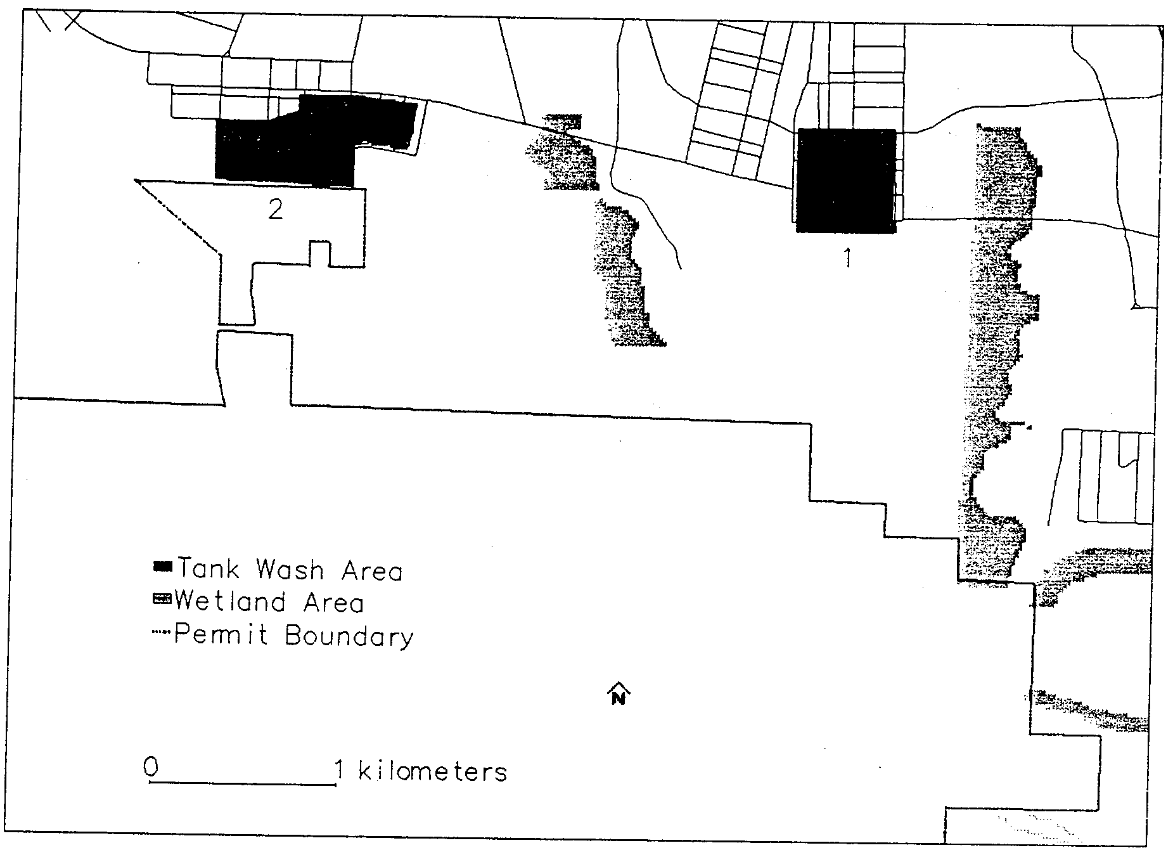

Figure 3-38 Detailed Environment, Primary and Alternate Tank Wash Sites

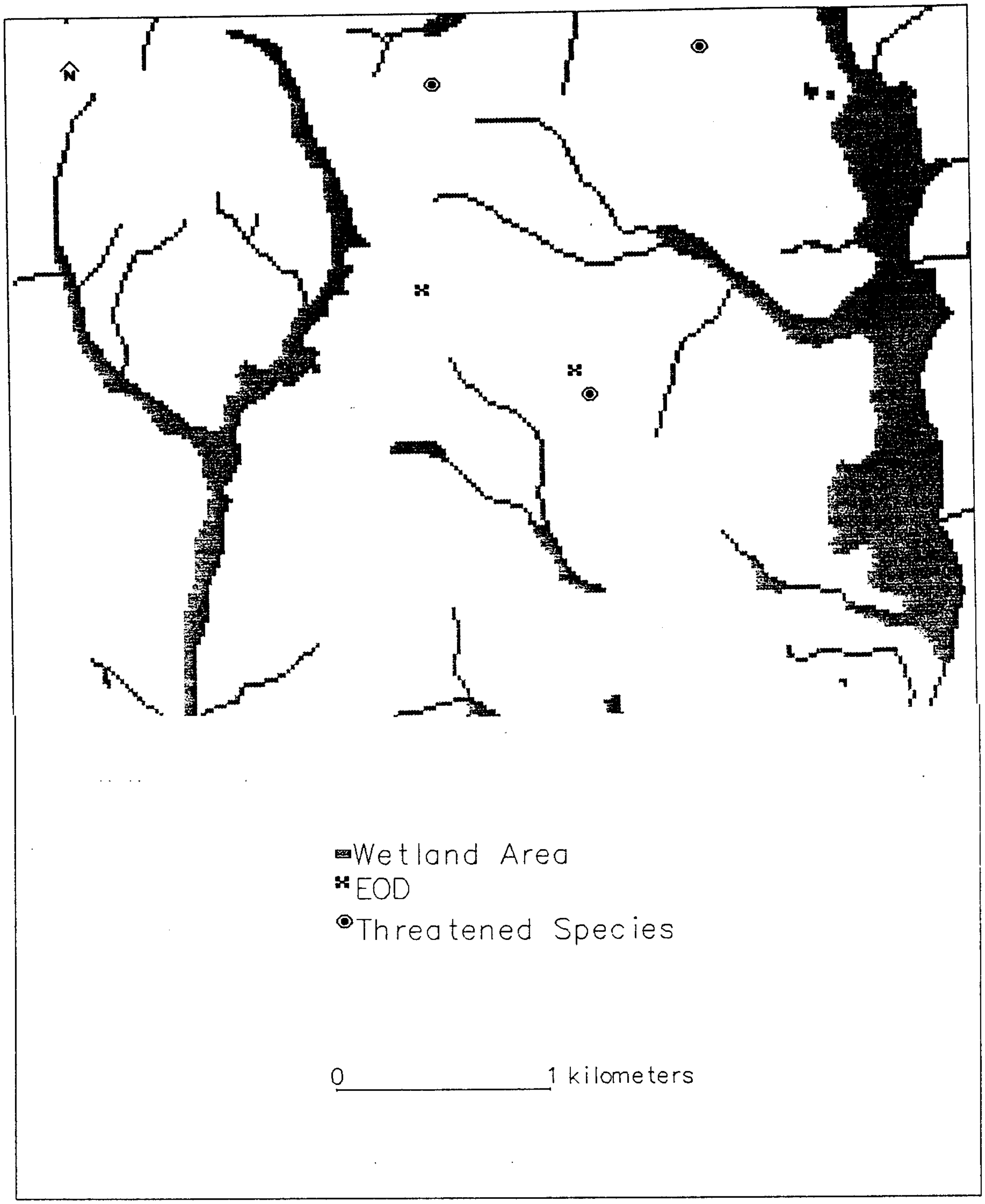

Figure 3-39 Detailed Environment, Primary and Alternate EOD Areas

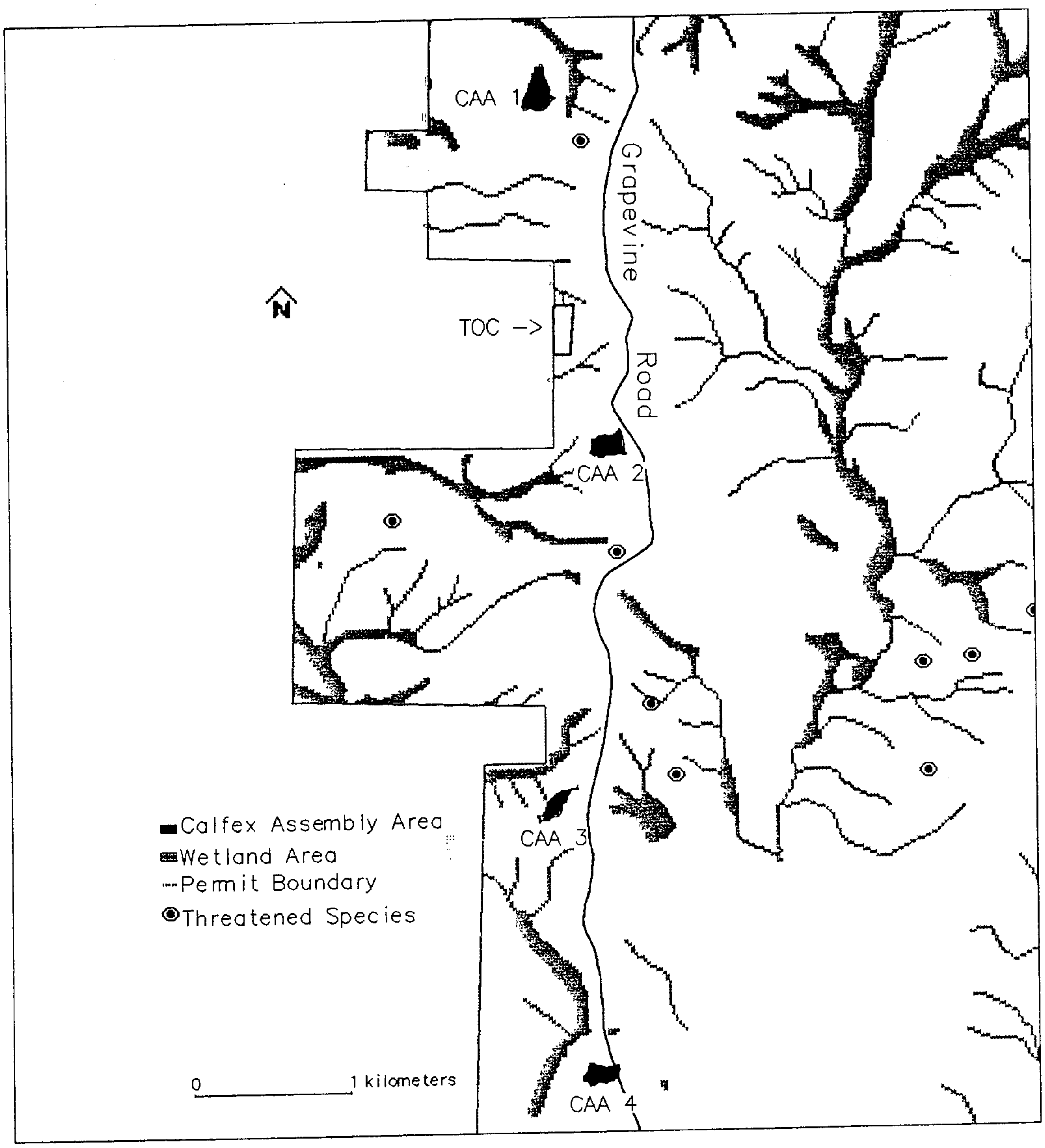

Figure 3-40 Detailed Environment, CALFEX Assembly Areas and TOC Site

The cover crop, the kind of fertilizer, and the time of application are three factors which significantly affect the potential impact (Barber, 1984; Gregory, 1987; Glass, 1989). Under the current revegetation practices, it is projected that slightly more than 20 pounds of nitrogen are lost per acre per year (Appendix S), as opposed to approximately 10 pounds per acre per year under optimum conditions. No adverse effects have been specifically noted, but this six-fold increase in nitrogen loss does have the potential to cause the types of ecosystem problems indicated above.

3.3.1.6 Ground Water

Troop numbers will not increase on Camp Shelby with respect to Alternatives 1-5, therefore, no adverse effect on groundwater withdrawal in terms of usage or depletion is expected. Alternative 6 would be expected to have a positive effect on ground water usage as a result of closing the installation. Two of the training facilities projects do, however, have a close relationship to the groundwater environment in that both are expected to improve the present conditions. They are discussed below.

Explosive Ordnance Disposal (EOD) Site: Groundwater monitoring is a condition of the permit required to be obtained for waste disposal activities. The proposed EOD site will be monitored to detect changes to groundwater quality. The primary purpose for proposing new construction at this site is to preclude the possibility that groundwater contamination might result from explosives residues as a result of operation of a less sophisticated disposal procedure.

Automated Tank Wash Facility: The automated tank wash facility will recycle water and has the potential to save up to 90-95 percent of present water usage when in use as opposed to a conventional wash rack facility. This usage has not been measured, but is roughly 10,000 to 20,000 gallons per tracked vehicle washed, depending on soil conditions. The implementation of the tank wash thus has the potential to save significant quantities of well water.

3.3.2 Biological Environment

3.3.2.1 Vegetation

3.3.2.1.1 General

The technique proposed to modify forested areas to provide lines-of-sight and maneuver space was developed with the need to maintain good habitat in mind. As part of the environmental consideration process, Camp Shelby Training Directorate and Facility Engineering staff officers were asked to utilize the environmental constraint map (see Figure 1-8) and the detailed environmental considerations maps (see Figures 3-25 through 3-28, 3-30, and 3-34 through 3-37) to reconfigure, in concept, the proposed training areas into areas suitable for the various tactical scenarios (Figures 1-16 and 1-17).

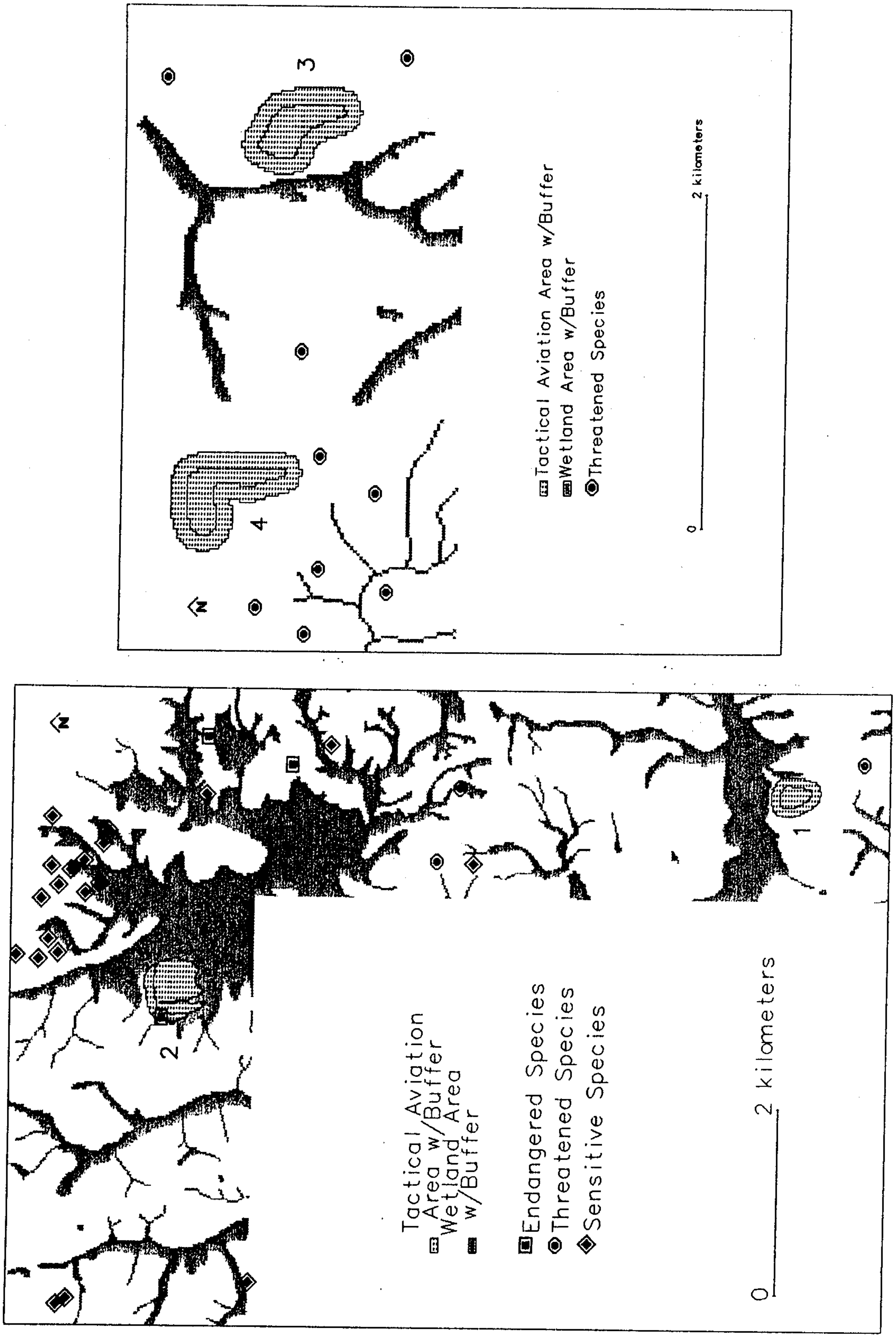

Figure 3-41 Detailed Environment, Proposed Tactical Aviation Areas 1, 2, 3 and 4

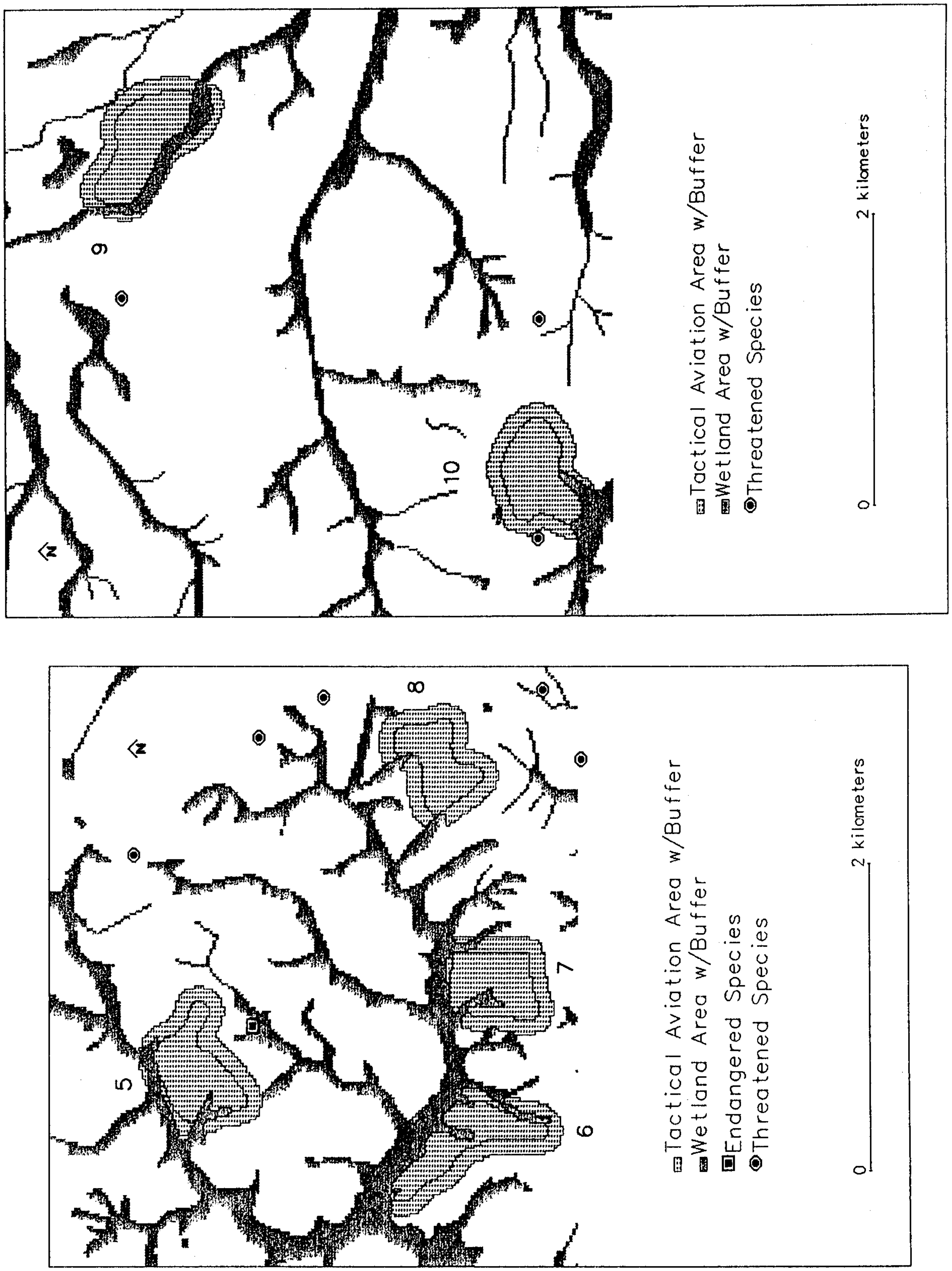

Figure 3-42 Detailed Environment, Proposed Tactical Aviation Areas 5, 6, 7, 8, 9 and 10

Through this process a concept for selective timber removal was developed. As a result, much of the forest vegetation is proposed to remain in place to reduce the amount of forest fragmentation even in those areas considered the most severely modified (i.e., PTAs 1-3). Proposed layouts for timber removal are depicted in Figures 3-22 through 3-30. The actual layouts are dependent upon site-specific implementation of appropriate mitigation measures identified in this EIS. Threatened, endangered and sensitive (TE&S) species locations linked with adjacent wetlands with their buffers and soils poorly suited for tracked vehicle maneuver were utilized in locating no-action areas. These no-action areas were then linked to other forested areas to provide contiguous habitat corridors. Although the general locations are indicated in the figures above, the thinned, cleared, and no action areas may change to some extent following site-specific analysis. The proportionate acreages are realistic and will serve for analytic purposes.

The maneuver areas associated with Alternatives 1-3B have been conceptualized and numeric values have been generated for acres proposed for 1) clearing and thinning (in order to provide for line-of-sight, timber will be removed in areas with environmental constraints), 2) tracked vehicle maneuver, 3) no action. Examples of no action areas are wetlands with their buffers, soils poorly suited for tracked vehicle maneuver, steep slopes, threatened, endangered and sensitive (TE&S) species habitat and biological corridors used to link adjacent no action areas and existing forest (Table 3-17). These areas associated with Alternatives 1-3B, range from approximately 40 percent to 49 percent. Conversely, the tracked vehicle training acreage ranges from approximately 40 percent to 50 percent (Table 3-17).

The estimated number of acres classified as "no action" for Alternative 1 is 14,656. There will be 14,939 acres cleared and 5,916 acres thinned in this alternative. Of these cleared and thinned acres, it is estimated that 17,459 will be used for tracked vehicle maneuver. Therefore, if Alternative 1 is implemented, an estimated 17,459 acres of the proposed 35,512 acre maneuver area will be considered usable for tracked vehicle maneuver (Table 1-3, Table 3-17, and Figures 3-22 through 3-26).

The estimated number of acres classified as "no action" for Alternative 2 is 12,824. There will be an estimated 12,738 acres cleared and 6,262 acres thinned in this alternative. Of these cleared and thinned acres, 15,995 will be used for tracked vehicle maneuver. Therefore, if Alternative 2 is implemented, 15,995 acres of the proposed 31,824 acre maneuver area will be considered usable for tracked vehicle maneuver (Table 1-3, Table 3-17, and Figures 3-22 through 3-26).

The estimated number of acres classified as "no action" for Alternative 3A is 4,359. There will be approximately 4,517 acres cleared and 2,724 acres thinned in this alternative. Of these cleared and thinned acres, approximately 5,820 will be used for tracked vehicle maneuver. Therefore, if Alternative 3A is implemented, about 5,820 acres of the proposed 11,601 acre maneuver area will be considered usable for tracked vehicle maneuver (Table 1-3, Table 3-17, and Figures 3-22 through 3-26).

The estimated number of acres classified as "no action" for Alternative 3B is 10,615. There will be approximately 5,273 acres cleared and 5,995 acres thinned in this alternative. Of these cleared and thinned acres, about 9,036 will be used for tracked vehicle maneuver. Therefore, if Alternative 3B is implemented, about 9,036 acres of the proposed 21,883 acre maneuver area will be considered usable for tracked vehicle maneuver (Table 1-3, Table 3-17, and Figures 3-22 through 3-26).

Training and maneuver damage to herbaceous vegetation under Alternative 1 would result from impacts described in Section 3.3.1.3 (soils). In general, disturbance to the soils in question (soils index 1-5) from a one-time pass of a tracked vehicle when the soil is dry can be naturally mitigated within one year, based on unpublished data from Fort Hood, Texas (also see Section 3.5.2.1.1 of this document). However, if soils are wet, extensive damage can occur to the herbaceous vegetation with a one-time pass. Extensive rehabilitation may be necessary as a mitigation measure if intensive maneuver training takes place on dry soils disturbing the vegetation or if one-time maneuver training takes place on wet soils.

Alternatives 4-6 do not propose reconfiguring maneuver training areas. No change in the current use of lands would occur under Alternative 4. Under either Alternative 5 or 6, the amount of land that would go back to forest management is discussed in Section 3.3.2.3. Section 3.3.2.3 (Forestry), describes in detail for National Forest lands only, the species of timber and the acres of each age class to be removed. The section also identifies the acres that are presently authorized for tracked vehicle maneuver on Camp Shelby and how much would no longer be needed and would go back to multiple use management under each of the Alternatives 1-3B, and 5 and 6 (Appendix O).

Automated Tank Table VIII (ATT VIII): Because the proposed facility is an upgrade of an existing Tank Table VIII on Range 45, no significant impact on the vegetation of the general area is expected during construction or operation of the ATT VIII; however, an increase in wildfire may be expected because of increased use of the range. Approximately 70 acres of Range 45 will be disturbed during the construction process. Some individual upland longleaf pine trees, generally less than 20 years of age, would be removed for construction of the access roads and administrative area. One small (less than 5 meter wide) wetland area would be crossed on this road. All disturbed areas will be graded, seeded and mulched according to Camp Shelby erosion control specifications as soon as practical (7 days or less) or sediment catchments will be constructed if a longer period is required before rehabilitation.

Overall, the areas affected are characterized as very sparsely forested (about 5 to 8 mature trees per acre), with a shrub layer of small (less than 4 meter) blackjack and post oak, with occasional sumac shrubs. The groundcover is more than 90 percent grasses. The vegetation common in and around the proposed construction sites was characterized in Table 3-15. Vegetation in the areas of the proposed roads B,C,D and E, the staging and maintenance areas, and the administrative and observation tower areas (see Figure 1-20) is characterized as follows: The overstory timber is open (< 25% canopy cover) comprised of two - twelve year longleaf pine, scattered groups of 50 year-old loblolly pine (10-15/Acre), hickory and blackjack oak; the shrub layer is comprised of poison ivy, shining sumac, yaupon, rubus, red

maple, cyrilla and alder; the herbaceous layer is primarily (70%) bluestem, muhlenbergia, paspalum, gayfeather and *Eryngium*.

The most significant concern is for the vegetation in the wetland area that is between the firing and the target zones (see Figure 3-31). Ten acres of forest, with some trees up to 15 meters high, are in conflict with the proper line of sight to the SPTs. It is proposed that these trees would be hand cut to a minimum stump height of 6 inches and left on the ground (see Figure 3-31 and Table 3-15). These areas are characterized by an overstory from very dense to sparse sweet-bay, cucumber tree, red oak and sweetgum. The shrub layer is composed of gallberry and yaupon. The herbaceous layer is composed of switch cane, hibiscus, hypericum and sedges in the open areas.

The STAB RUN and long-range target array areas (see Figure 1-20) are characterized by 1-meter stumps of cut post oak and blackjack oak with 4 year old regrowth from the stumps. Some small loblolly and shortleaf pine also occurs in these areas. The primary shrub is the shining sumac and the herbaceous layer is composed primarily (70%) of bluestem, muhlenbergia, paspalum, *Eryngium*, gayfeather and *Eupatorium*.

- Prescribed Burning Program -- Prescribed burning has been proposed by the National Guard to control wildfires ignited from tracer ammunition fired on tank/machinegun ranges and alleviate range gunnery down time. Past experience has shown that a majority, if not all of the down range area, will eventually be burned by wildfires during the course of the year. The Forest Service has approved annual burning of the ranges, within approved boundaries, provided the following guidelines are followed. Frequency of control burning each year would be minimal. A wet line, designated by the fire boss, would be made by helicopter with a water bucket around the target area (down range) of tank/machinegun ranges to control and alleviate fire growth beyond the target area. Existing down range service roads running east and west, on the north and south of the target area will be used as fire breaks. To the rear of the target area is an existing road that will also be utilized as a fire break in addition to the wet line. If possible, the total burning of the tank/machinegun range target area described above will be accomplished during ideal burn conditions by Range personnel under the direct supervision of a qualified Forest Service burning boss. Guidelines set by the Camp Shelby Erosion Control program will be followed after each prescribed burn. The above described measures would ideally need to be conducted at least once annually, to prevent the loss of training time to Army National Guard units. Loss of training time requires more weekends needed to qualify crews not trained due to range down time fighting range fires.

Seeding lespedeza is recommended to mitigate the impact of annual burning that is referenced in the Erosion Control Plan for Camp Shelby, Mississippi. Also by changing the cover type, the fuels will be less flammable than the bluestems and muhlenbergia grasses that are currently on the sites. In addition, the nitrogen fixation of the lespedeza will restore and improve range soil conditions over time. Consideration should be given to hardening the target equipment sites with gravel/slag to protect the sites from wildfire.

- Timber Removal -- Approximately 100 acres of upland pine and oak timber will be cut at a 6 inch maximum stump height to create lines-of-sight from the STAB RUN and defilade positions to the appropriate targets (Figure 3-31 and Table 3-15). Also required is a line of sight from the control tower to all points on the range to ensure proper control of operations. The timber east of Poplar Creek is considered contaminated following many years of range use, and is considered to be of no commercial value. The timber on the west side of Poplar Creek is considered possibly contaminated and can be sold as such, at a discount. Approximately 10 acres of bottomland hardwood timber occurs in two wetland areas associated with Poplar Creek or its tributaries, within the areas considered needed for proper lines-of-sight (Figure 3-31 and Table and 3-15). This timber will be hand cut at a minimum 6 inch stump height and felled parallel to the stream channel, though not in the stream, and left to decay. The resprouts will be hand cut on an appropriate maintenance schedule.

- Use of Pesticides -- The herbicides *Roundup*® and *HYVAR X-L*® were originally proposed by the National Guard to control weedy plant growth on and around all defilade positions and targets to maintain proper visibility. Frequency of use each year would be minimal, once in the spring to control cool-season weeds and again in mid-to late-summer to control warm-season weeds. Since *HYVAR X-L*® was determined not to have been approved for use on National Forest lands its proposed use was withdrawn, and glyphosate (*Roundup*®) was recommended for use. Evaluations of proposed uses were covered by an Environmental Assessment prepared by the USFS (Appendix V).

Multiple Purpose Range Complex-Heavy:

- Primary Site -- Two of the six lanes required for the MPRC-H could be built on an existing range, minimizing impacts to vegetation of the area. About 1,400 acres of timber on the remaining portion would have to be cut (see Section 3.3.2.3) and at least one road constructed in the area. Good grass cover should be established in the areas where timber is cut to stabilize the soil and minimize erosion in those areas where timber has been removed.

- Alternate Site -- The south-east half of this site is currently used as a tank maneuver area and a drop zone. Much of the area is cleared of timber and there is good herbaceous cover. The north-west half supports about 1,400 acres of timber that would be cut (see Section 3.3.2.3). Good grass cover should be established in the areas where timber is cut if wildfires are effectively controlled.

Automated Tank Wash Facility:

- Primary Site -- The entire 69 acre site supports 40+ year-old timber that would have to be cut. All herbaceous vegetation would be removed for construction purposes.

- Alternate Site -- Over half of this 89 acre site is an existing tank motor pool and holding area, and less timber would have to be cut than in the primary site. All herbaceous

vegetation in the area would be removed for construction purposes. There would be no significant impact on surrounding vegetation from either site.

Explosive Ordnance Disposal (EOD) Facility: The primary or alternate site would have to be cleared of all vegetation that would serve as fuel. Both sites are open woodland sites and do not contain much timber. In addition, either site would require a lane 800 meters in length to an observation bunker with a clear line-of-sight. Preparation of either site would have no significant impact on the surrounding vegetation.

Combined Arms Live Fire Exercise Assembly Areas (CALFEX-AA): The Combined Arms Live Fire Exercise Assembly Areas would impact very little timber or other vegetation. Timber would be cut only to upgrade the existing trails or roads where the assembly areas are designated and would total approximately 75 acres. Concurrent training will utilize existing tank maneuver and other open areas to provide lines-of-sight and movement zones without modification.

Tactical Aviation Training Area (TAA): Environmental analysis of the 10 sites indicates that development of sites 1, 3, 4, and 8 would result in the fewest environmental constraints. The amount of timber involved is minor because the sites were located in areas that have been recently harvested. However, areas that would need to be leveled to at least a 6% slope will require immediate rehabilitation and revegetation. Guidelines from the Erosion Control Plan will be followed during construction and operation of the areas.

3.3.2.1.2 Threatened, Endangered and Sensitive Plant Species

Only one federally listed candidate plant species, the silky camellia, is known to occur on Camp Shelby (in proposed training area or PTA 1); these locations were avoided during this planning process. There are 19 plant species on the Forest Service sensitive plant list for the De Soto National Forest (see Section 2.4.5.2). As of November 1990, 13 of the 19 plant species have been located on Camp Shelby by field crews under U.S. Army Construction Engineering Research Laboratory (USACERL).

Only minor impact from the proposed facilities is expected because 17 of the 19 are typically found in wetland areas. Specific efforts are being made to avoid wetland areas during development and operation of all proposed maneuver areas and facilities.In the absence of specific design modifications and other environmental protection measures, the potential exists for impact on sensitive plant species from development of the proposed maneuver areas.

3.3.2.1.3 Proposed Botanical Areas

The proposed botanical areas will continue to be off-limits to motorized vehicles - both wheeled and tracked - under all proposed alternatives. Some light foot travel will continue, such as that associated with compass course training. Environmental effects are predicted to be very small to nonexistent.

3.3.2.1.4 Pesticide Usage

Since insecticides and herbicides are not used in any widespread manner in the maneuver areas, per se, none of the action alternatives (Alternatives 1, 2, 3A, 3B, or 4) is expected to have any resulting increase in applications of any chemicals. As discussed in Section 3.1.2.1, their usage is restricted to specific target areas and firing points. Construction of the Tank Table VIII and multiple purpose range complex-heavy (MPRC-H) will involve placement of more targets, and herbicide usage around them will require that more area be treated, but no increase in rates or frequency is proposed. All applications will continue to be in accordance with U.S. Forest Service requirements (see Appendix V.)

3.3.2.2 Agriculture

Implementation of any of the proposed actions is not anticipated to have any effect on any agricultural enterprise in the vicinity of Camp Shelby.

3.3.2.3 Forestry

This section pertains only to National Forest lands within the Camp Shelby permit area. Department of Defense (DoD) or State-owned lands are not included; therefore, certain tabular and graphical data, especially those counting acres within the area, may not match exactly those found in previous sections.

The long-term effect on forestry of implementing any of the proposed alternatives is contingent upon its effect on the managed timber base. Removing sizable acreages from the managed timber base has the potential for adverse impacts on the local forest products industry (Section 3.1.4.3). Conversely increasing the acreage has positive long term impacts. Alternative 5 would add about 13,000 acres to the managed timber base and Alternative 6 (without the main impact area) about 20,000 acres (Section 3.3.2.3.1).

The proportional effects of implementing any of the alternatives are minor when compared to the total managed timber base of the De Soto National Forest or the regional timber marketing area (Section 3.5.4). The Black Creek Ranger District contained 173,531 acres of land suitable for management of forest products at the time of data collection for the National Forests in Mississippi Land and Resource Management Plan, 1981. Of this, 85 percent was pine management type, over 147,000 acres. Figure 3-43 shows the breakdown of pine timber types potentially affected by each action alternative.

Removing and marketing large volumes of timber over relatively short periods of time (1-2 years), such as are possible under Alternatives 1, 2, 3A, and 3B in the absence of planning to minimize such adverse effects (Tables 3-21 and 3-22) may have both positive and negative consequences. Such artificially accelerated harvests can adversely affect private stumpage holders, who may find themselves in the role of a seller in a buyer's market. Many timber holders rely on occasional sales to supplement their income or as a primary source of income.

In the five county economic area, there are 267 registered tree farmers with 120,461 acres under management, an average of 451 acres per tree farm.

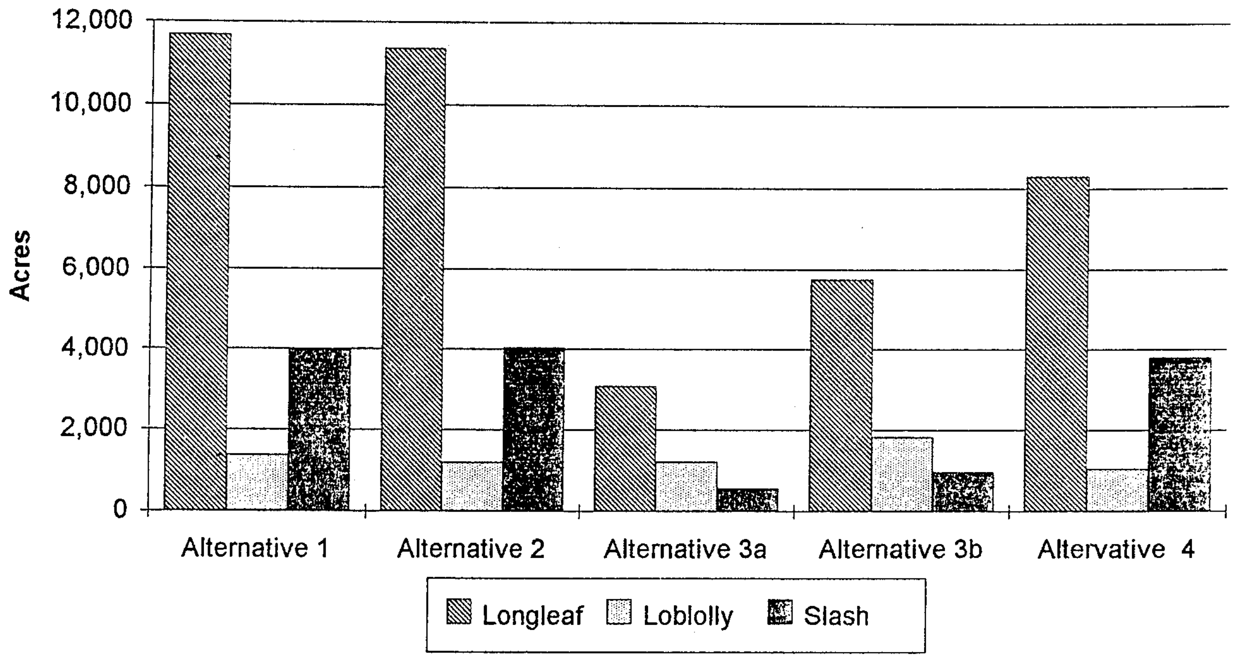

Figure 3-43 Total Acres Within Pine Timber Types Affected by Action Alternatives

Table 3-21 Timber Impact Table (Pine timber types)

	NATIONAL FOREST ACREAGE SUMMARY					Implementation Volume (MMBF)	
	Total Acreage			Longleaf Pine Acreage			
	No Action	Thinned	Cleared	Thinned	Cleared	Thinned	Cleared
PTA 1	5075	1897	2836	1421	2031	1.304	22.328
PTA 2	6893	2482	5915	1499	3762	2.039	44.388
PTA 3	2193	819	1722	364	870	0.105	1.697
PTA 4	336	1253	59	766	58	1.750	0.488
PTA 5	1155	0	1207	0	373	0	9.775
PTA 6	4973	2852	259	2200	204	2.024	2.349
Corridors Alt 1	338	620	3647	573	1093	0.676	27.768
Corridors Alt 2	288	346	3148	322	711	0.398	24.208
Corridors Alt 3A	184	471	946	284	288	0.512	5.370
Corridors Alt 3B	365	804	1385	456	338	0.957	9.254
Primary MPRC-H	1023	0	1439	0	479	0	4.159
Alternate MPRC-H	358	0	1431	0	475	0	8.124

Short-term large volume timber removal can, however, be favorable to the mill owner as he has a reliable supply at somewhat lower prices for a short period. In times of strong end product demand, there may be fuller employment for mill employees. The local logging contractor is in the favorable role of working closer to home with shorter haul distances.

Table 3-22 National Forest Timber Removal Summary

Alternative	Volume (MMBF)	Value Mill$	Acres			
			Cleared	Thinned	No Action	Total
1	100.31	13.354	14,112	5,814	14,480	34,406
2	96.90	9.829	11,953	5,974	12,579	30,506
3A	19.69	2.491	3,935	2,542	3,864	10,341
3B	28.40	3.444	4,629	5,725	9,017	19,371
*4	0	0	5,372	9,411	1,727	16,510
5	0	0	0	0	0	0
6	0	0	0	0	0	0
*T-19, T-43	0	0	758	443	0	1201

Acreage does not include firing points within maneuver areas.
*Areas previously cut

Additional impacts may occur within the U.S. Forest Service. The three De Soto Ranger Districts, all of which administer National Forest lands within the five county economic area, sell approximately 70 million board feet annually. Any appreciable increase in sales or harvest on one district would require additional personnel detailed to assist in the preparation. This could result in reduced sales from the supplying district which may offset the impacts to local timber owners as discussed above. This in turn reduces the acreage of regeneration elsewhere on the three Districts and a possible cumulative effect could result if no mitigation is planned. This possible effect on Ranger District operation and Nursery production is discussed in Section 3.5.4, "Forestry."

The National Forests in Mississippi Land and Resource Management Plan (LRMP) considered the De Soto NF one of five marketing areas. This was based on similarity of purchasers, prices, and species sold. Thus all consequences are considered to fall equally on the entire regional market.

Removal of the timber for implementation of either Alternative 1 or 2 in less than four years would have a potentially significant negative impact on Ranger District operations on the three De Soto Districts. It would depress private stumpage prices unless the timber sale programs on the three Ranger Districts were drastically curtailed. This could result in reduced staffing and severe cutbacks in several programs associated with and financed through timber sales, such as road maintenance, reforestation, wildlife habitat improvement, prescribed burning, and threatened-endangered-sensitive species habitat management. Recognizing this potential problem, the National Guard does not propose this type timber removal schedule.

By limiting annual timber removal to not more than 20 MMBF, thus spreading the impacts over 4-5 years, private stumpage prices could be better maintained and the three Ranger Districts could maintain a smaller sales program until the regular timber program could resume. It is agreed between the National Guard and the National Forests in Mississippi that plans to regulate the entrance of this timber into the market over a period of not less than 4 years be prepared and followed if either Alternative 1 or 2 is selected for implementation.

Timber removal under alternative 3A or 3B could be accomplished in 2-3 years with little or no effect on the timber program of the De Soto National Forest.

Within four of the action alternatives (1-3B) are plantations established as part of the timber management program. These range in age from less than a year to about 30 (see Figures 3-44 through 3-49 for an age class breakdown). The investment cost in these plantations is about $200 per acre for those established in the last ten years and somewhat less for those established earlier.

Implementing any of the action alternatives will result in harvesting or cutting many trees before they are financially mature. The following text table displays the value increase through time of an average co-dominant pine tree in a managed plantation.

Tree Age	10	20	30	40	50	60
Tree Value*	$0.31	$1.09	$8.72	$15.42	$24.75	$40.57

*1990 stumpage values

Thus, harvesting or eliminating a plantation costs not only the establishment investment, but also an appreciable loss of value through the removal of financially immature trees. The following text table displays, by alternative, the acres of pine plantation established from 1960 through 1991 which will be cleared or thinned.

Alternative	1	2	3A	3B	MPRC-H*
Plantation Acres	4419	4792	1118	1572	680

*Primary site

Tactical Aviation Training Area (TAA): The proposed sites involve relatively small acreages - three sites of approximately 25 to 60 acres and one site of approximately 150 to 250 acres - which will have only extremely minor effects on the local timber supply both short term and long term. All proposed sites utilize regeneration areas and edges of proposed corridors.

Multiple Purpose Range Complex - Heavy (MPRC-H): The proposed sites would remove approximately 1800 acres on the alternate site and 2300 acres on the primary site from the available timber management base. Of and by themselves, the losses are relatively minor and can be absorbed with little or no effect. Of the MPRC primary site containing merchantable timber outside of wetlands, 723 acres are thirty years or less in age. These acres were former tank maneuver areas which re-seeded naturally in the 1960's or were planted in the 1970's. They are just now entering their peak merchantable/value growth period. Thus these production losses are more significant than if older timber stands were involved. It also means loss of the planting investments of 20 years ago. This is also why the value of the timber to be removed is so low as shown in Appendix O. In contrast, only 196 acres (18%) of the alternate site is in timber less than 30 years of age. This also is reflected in the volume and values in Appendix O.

3.3.2.3.1 Predicted Effects on Timber Volumes

The action alternatives (Alternatives 1-3B), all contain areas which are now authorized for tank maneuvers and areas where tank training is not presently allowed. If any of these alternatives is implemented, some currently authorized tank training areas within PTAs and corridors and containing timber would be either thinned or cleared. Also, the currently authorized areas outside the PTAs and corridors (returned tank areas in Table 3-23, 3-24, and 3-26) would return to regular National Forest management and enter the managed timber base. Previously cleared areas would be planted while those acres containing timber would be subject to cutting in the normal course of stand examination and contribute volumes annually to the market place.

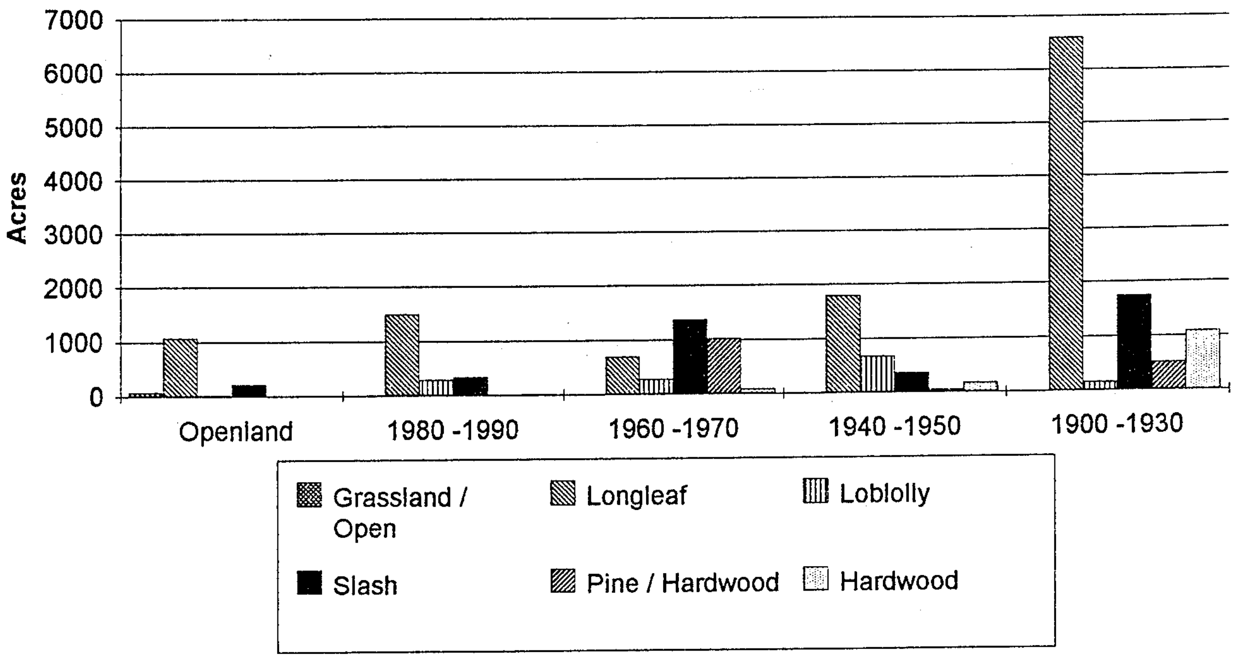

Figure 3-44 Total Acres of Timber Affected In Alternative 1 By Age Class

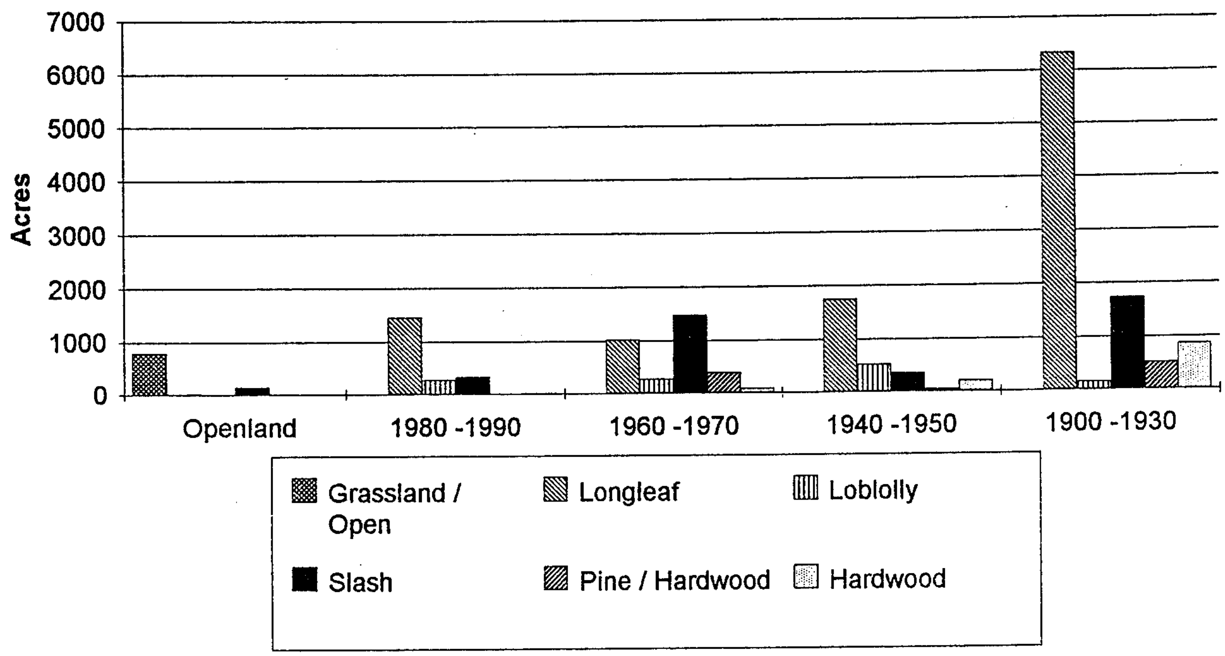

Figure 3-45 Total Acres of Timber Affected In Alternative 2 By Age Class

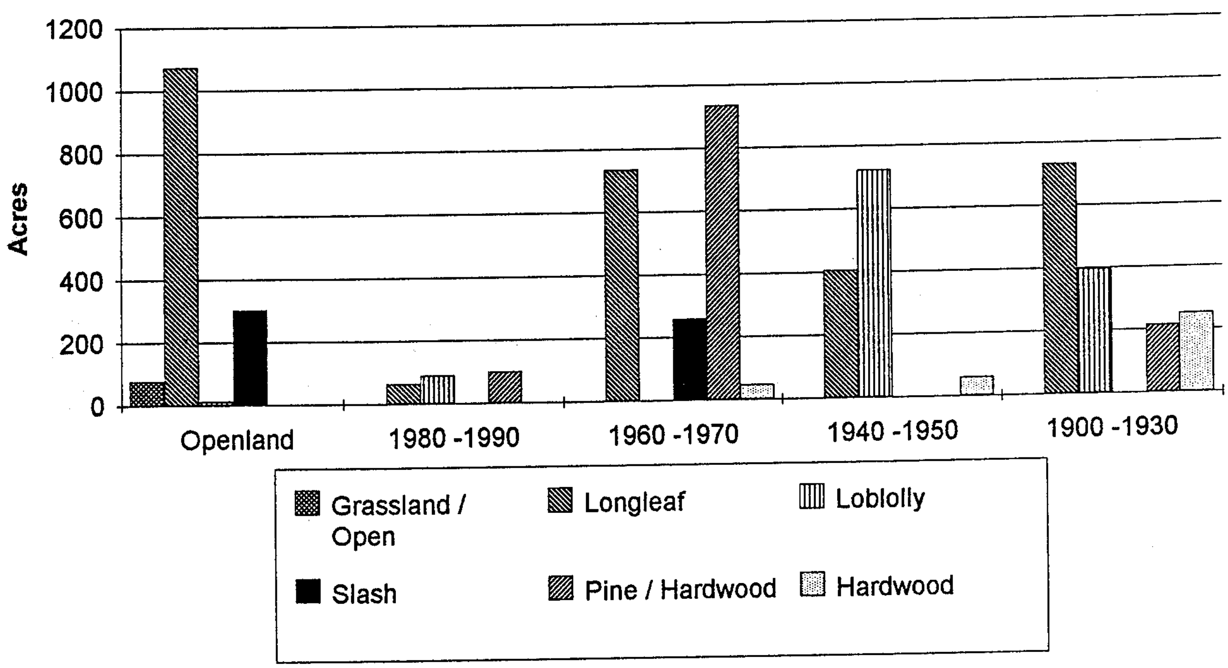

Figure 3-46 Total Acres of Timber Affected In Alternative 3A By Age Class

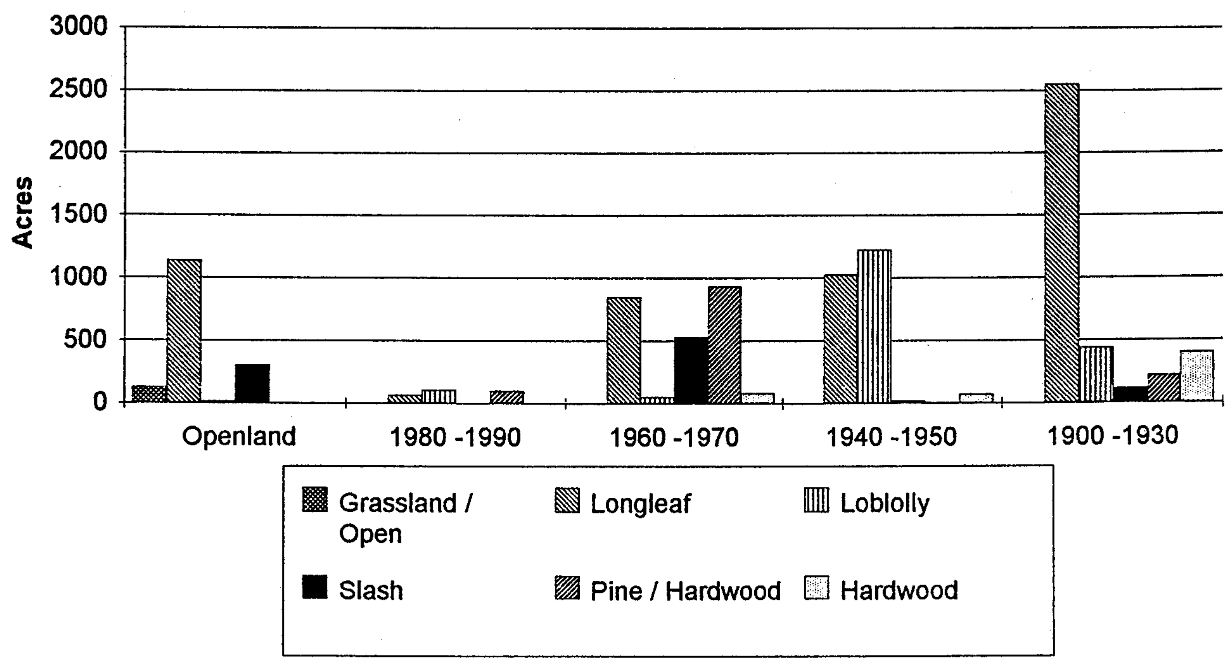

Figure 3-47 Total Acres of Timber Affected In Alternative 3B By Age Class

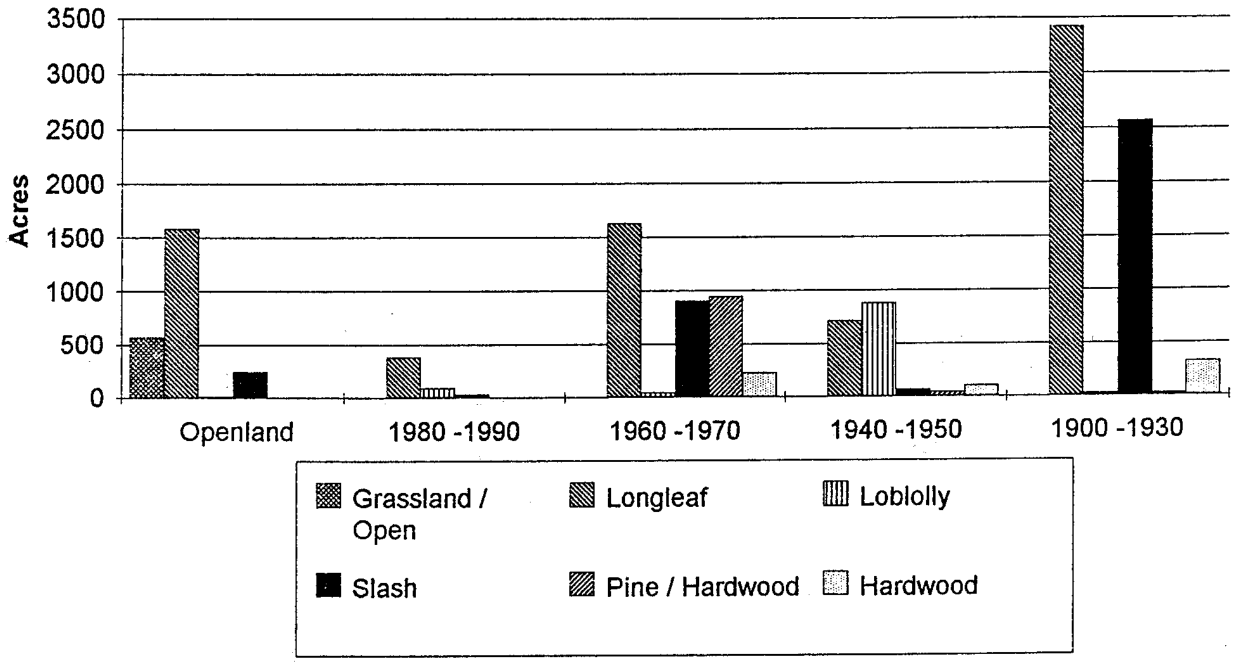

Figure 3-48 Total Acres of Timber Affected In Alternative 4 and 5 By Age Class

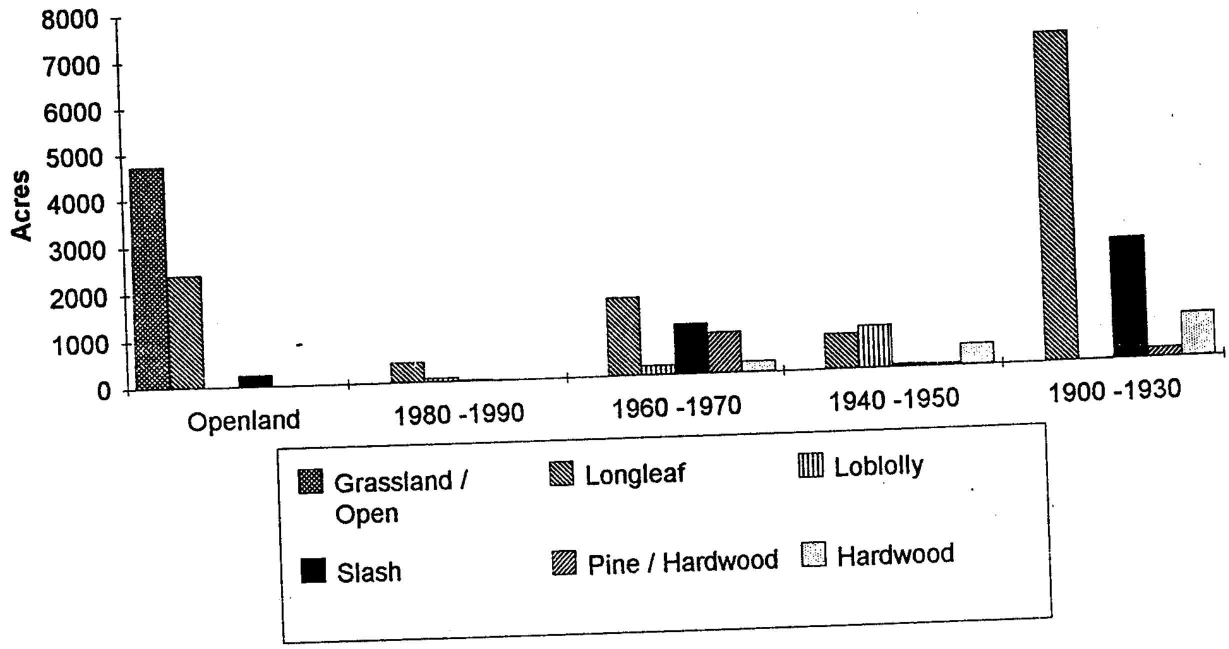

Figure 3-49 Total Acres of Timber Affected In Alternative 6 By Age Class

Table 3-23, "Volume Comparisons," reflects the volumes of timber estimated to come off these acres both as implemented and if under normal forest management while Table 3-26 shows the values associated with these volumes and Table 3-24 shows the implementation acres in the various categories of tank usage. The reader should keep in mind that under Alternative 4 there will be no change from what is currently under management. Timbered areas authorized for tank maneuvers are not under a timber management program and do not contribute volume to timber sales. Therefore, Alternative 4 has no effect on either the 25 percent returns or the amount of timber being put on the market.

Table 3-23 compares the volume estimated to be harvested if a given alternative is implemented with those volumes which may be harvested over a forty year period, in ten year increments. Part A is the volume to be harvested from current tank training areas which lay within a given alternative. The difference column is this volume compared with that which would be harvested from these areas if they continued as tank training areas (Alternative 4). Part B compares the volume to be cut from new tank areas (PTA's and corridors) within each alternative with that which may be expected to be harvested under normal management over a forty year period. It may be noted that it takes about twenty years of cutting under regular management to equal the volume cut in implementation. Part C is the volume expected to be cut over the next forty year period from current tank training areas which would be returned to normal management. The difference column is this volume compared with current management, Alternative 4. Part D is the total volume difference resulting from implementing each of the proposed alternatives compared to current management over a forty year period.

These volume comparisons (Table 3-23) show that no alternative is estimated to result in a reduction in the amount of timber to be harvested over a 40 year period when compared to what may be expected from a continuation of current management. This is because of the timber harvests which will occur on areas currently designated for tank maneuvers and from which no timber cutting is planned under current management. Only about 3500 acres have been cleared for current tank maneuvers. The remainder is in age classes fairly typical of the De Soto National Forest.

Note that all alternatives show an increase over current management both short and long term (Table 3-26). Again, this is due to the cutting of currently authorized tank maneuver areas for implementation and/or to returning them, partially or in total, to normal forest management.

The short term effects show no significant difference among alternatives and may be termed negligible - within the error limits to be expected in the estimation. The long term effects, however, are more significant. While the effect of implementing Alternatives 1 and 2 may be termed negligible, there are significant increases in the volume estimates for Alternatives 5 and 6, and more modest increases for Alternatives 3A and 3B when compared to current

Table 3-23 Volume Comparisons (in MMBF)
(National Forest Acres)

Alternative	If Implemented	Period 1	Period 2	Period 3	Period 4	Total	Difference
A. Current Tank Areas							
1	22.30	0	0	0	0	0	+22.30
2	18.70	0	0	0	0	0	+18.70
3A	2.83	0	0	0	0	0	+2.83
3B	7.76	0	0	0	0	0	+7.76
4	0	0	0	0	0	0	0
B. New Tank Areas							
1	78.01	37.27	40.14	48.54	52.03	177.99	-99.98
2	78.20	35.80	42.18	48.94	50.82	177.73	-99.53
3A	16.87	6.63	10.49	11.33	10.91	39.36	-22.49
3B	20.64	14.43	21.30	23.91	22.07	81.71	-61.07
4	0	0	0	0	0	0	0
C. Current Tank Areas to be Returned to Forest Service Management							
1	-	18.22	25.24	31.89	28.51	103.86	+103.86
2	-	19.34	25.89	36.58	32.86	114.67	+114.67
3A	-	22.00	28.40	37.66	33.90	121.96	+121.96
3B	-	16.61	19.89	18.18	19.98	74.65	+74.65
4		0	0	0	0	0	0
5	-	27.73	37.46	49.43	47.91	162.52	+162.52
*6		41.46	54.78	68.87	70.31	235.41	+235.41
D. Volume Difference From Current Management (Sum of A+B+C) Over 40 Years							
1	+26.18						
2	+33.84						
3A	+102.30						
3B	+21.34						
4	0						
5	+162.52						
*6	+235.41						

* Includes all Forest Service land used by military except Main Artillery Impact Area.

Table 3-26 Value Comparisons (Million $)

Alternative	As Implemented	Period 1	Period 2	Period 3	Period 4	Period Total	Difference
A. Current Tank Areas							
1	1.978	-	-	-	-	-	+1.978
2	1.570	-	-	-	-	-	+1.570
3A	.212	-	-	-	-	-	+.212
3B	.893	-	-	-	-	-	+.893
4	0	-	-	-	-	-	0
B. New Tank Areas							
1	11.376	4.665	6.417	7.529	8.348	26.959	-15.583
2	11.311	4.396	6.942	7.358	8.176	26.872	-15.561
3A	2.279	.912	1.278	1.627	1.581	5.397	-3.118
3B	2.551	2.007	2.911	3.609	3.480	12.007	-9.456
4	0	0	0	0	0	0	0
C. Current Areas Returned to Normal Management							
1	0	2.460	3.582	4.439	4.093	14.574	+14.574
2	0	2.611	3.622	4.931	4.533	15.698	+15.698
3A	0	3.138	4.104	5.487	4.844	17.572	+17.572
3B	0	2.410	2.860	2.152	2.350	9.773	+9.773
4	0	0	0	0	0	0	0
5	0	3.674	4.963	6.521	7.048	22.206	+22.206
6*	0	5.727	7.932	10.191	10.095	33.944	+33.944
D. Total Value Difference (A+B+C) From Current Management Over 40 Years							
1	+.969						
2	+1.707						
3A	+14.666						
3B	+1.210						
4	0						
5	+22.206						
6	+33.944						

* Includes all Forest Service land used by military except Artillery Impact Area.

Table 3-24 - National Forest Implementation Acres						
Alternative		**Current Tank Areas**[1]	**New Tank Areas**	**Returned Tank Areas**	**Other Returned Areas**	**Total Change**[2]
1	Clear/ Thin	4,329	15,597	8,254	0	-7,343
	Gross	6,157	28,249	9,142	0	-19,107
2	Clear/ Thin	2,693	15,234	10,759	0	-4,475
	Gross	3,576	26,930	11,746	0	-15,184
3A	Clear/ Thin	3,046	3,431	8,993	0	+5,562
	Gross	6,413	5,794	10,318	0	+4,524
3B	Clear/ Thin	4,056	6,298	5,865	0	-433
	Gross	6,394	12,977	6,779	0	-6,198
4	Clear/ Thin	14,651	0	0	0	0
	Gross	16,390	0	0	0	0
5	Clear/ Thin	0	0	14,651	0	+14,651
	Gross	0	0	16,390	0	+16,390
6[3]	Clear/ Thin	0	0	14,651	7,136	+21,787
	Gross	0	0	16,390	8,733	+25,153

[1] Current Tank Areas for the Action Alternatives 1-3B do not include the proposed retention of T19 and T43 Tank Training Areas.
[2] Returned Tank Areas minus New Tank Areas.
[3] Includes all National Forest land used by the military except Artillery Impact Area.

management. These differences may be expected to increase for an additional 20 to 30 years as the returned tank areas achieve more balance in the age class distribution and areas regenerated within the past thirty years maximize sawtimber growth.

3.3.2.4 Fish and Wildlife

3.3.2.4.1 General Impacts

Impacts to wildlife will result from timber removal and the structural alteration (earth-moving) of the land required to develop the proposed training areas (PTAs) and corridors, and subsequent training activities. Initial construction activities will have the immediate effect of displacing most resident wildlife to other areas (some displacement may be permanent), and would result in the loss of woody and herbaceous cover, and potential nesting, perching, and foraging sites. The woody debris left behind after harvest will provide cover and perching sites in the short-term, and as the debris begins to break down it should attract a greater variety of invertebrate and vertebrate species. Snags (standing dead trees) and down woody debris are heavily utilized by an array of birds, mammals, amphibians, reptiles, and invertebrates to satisfy a variety of needs, and are now accepted as an integral part of the forest ecosystem (Davis, 1983). Species tolerant of human activity or those preferring a disturbance-type habitat will return after a short time if suitable habitat remains.

Table 3-25 Volume/Value Impacts

Net Total - volume in MMBF; value in $millions								
	40 Years		Per Year		First Period*		Per Year	
Alternative	Volume	Value	Volume	Value	Volume	Value	Volume	Value
1	+26.18	+.969	.654	.024	40.52	4.438	4.052	.444
2	+33.84	+1.707	.846	.043	38.04	4.181	3.804	.418
3A	+102.30	+14.666	2.558	.367	24.83	3.350	2.483	.335
3B	+21.34	+1.210	.534	.030	24.37	3.303	2.437	.330
4	0	0	0	0	0	0	0	0
5	+162.52	+22.206	4.063	.555	27.73	3.674	2.773	.367
6	+235.41	+33.944	5.885	.849	41.46	5.727	4.146	.573

* Part A+C of Table 3-19+3-20. This is the timber entering the market which would not have under current management in any period.

Noise disturbance from clearing and construction activities would be confined to daylight hours, and is generally considered a relatively minor impact, as many species appear to have become habituated to military activities (Section 3.1.5.4). However, the potential for negative impacts to wildlife exists if the disturbance occurs during a critical period. The readers are advised to refer to Section 3.1.5.4 for a more in-depth treatment of noise impacts to wildlife. Construction activities will destroy or alter existing habitat, create new habitat (at least in the short-term), and increase the susceptibility of less mobile animals to direct mortality in the immediate work zones. Wetlands and riparian zones are particularly important ecologically in

terms of biodiversity and the number of species they support relative to adjacent habitats (Krzysik, 1990; Weatherford McDade Ltd., 1991). Proposed activities in or near wetlands thus have a greater potential for negative impacts to a wider variety of wildlife than animals occupying adjacent upland sites. Impacts to wetlands are discussed in Section 3.3.1.5.1, but a minor negative impact is expected to wildlife in those wetland sites proposed to be thinned or those in which new crossings will be constructed. This loss or alteration of existing wetland habitat is quite small when compared to the amount of wetlands that will not be disturbed under each alternative, but it is an impact nonetheless. The 100-foot buffer surrounding all wetland sites will help protect the wetland and mitigate some, but not all impacts.

Forest modification in proposed maneuver areas will create more open area and edge habitat within the forest. The readers are reminded that the intentional creation of islands of trees up to 50 acres in size that was discussed in the Draft EIS is no longer being proposed. Rather, timber not thinned or cleared will be connected to other stands whenever possible. A more comprehensive discussion on the effects of forest fragmentation and the creation of open areas is discussed in Section 3.3.2.6, which considers the impacts on biodiversity from the proposed actions. Whenever possible, remaining forest fragments will be connected via a woody corridor or planned in such a way as to minimize forest fragmentation and provide adequate avenues of dispersal for the majority of woodland species.

Tracked and wheeled vehicles driving off-road can impact the soil and vegetation after just one pass. Vegetation corridors can help alleviate some of the stress caused from vehicles through connecting forest fragments, preventing or minimizing access to all areas. However, repeated passes under wet soil conditions can reduce the amount of vegetative cover and species composition due to soil compaction, and/or physical damage to the plants themselves (Goran et al., 1983). Tracked vehicle activity can also impact the faunal component of the ecosystem as well. Species spending most or all of their lives at or below the soil surface (e.g., moles, shrews, and earthworms) are especially sensitive to frequent soil disturbance (Severinghaus et al., 1981), and it is uncertain how effective mitigation efforts would be in reducing their decline.

The effects of tracked vehicle activities on bird and small mammal populations have not been quantified within longleaf pine forests of Camp Shelby, but have been estimated on other Army installations. An estimated 20 percent reduction in overall avian biomass was attributed to intensive tracked vehicle training at Fort Knox (Severinghaus, 1984), a 25 percent reduction at Fort Lewis (Severinghaus and Goran, 1981), and a 40 percent reduction at Fort Hood (Severinghaus et al., 1981). These reductions in avian biomass were thought to be the result of a decrease in food resources attributed to a reduction in understory, disruption of vegetative stratification, and soil disturbance (Severinghaus and Goran, 1981). In most instances, there was a shift in species composition and relative abundance due primarily to the opening of the woodland and understory, but the total number of avian species frequently remained comparable in the tracked vehicle maneuver and control areas. In other words, even though species richness remained fairly constant, the net effect on biodiversity was negative, as the species assemblages were no longer as characteristic as the pre-disturbed habitat. Woodland species (e.g., wood thrush, tufted titmouse, and carolina chickadee) were negatively

impacted while species associated with open, bushy habitats were positively impacted (e.g., red-winged blackbird, starling, and rufous-sided towhee). A tentative impact table has been prepared for many species found in the Camp Shelby area which shows the potential for effects as a result of each alternative (Table 3-27).

Table 3-27

PROJECTED IMPACTS TO THE BIRDS OF THE CAMP SHELBY/DE SOTO NATIONAL FOREST AREA

Those species observed during the U.S. Army's Land Condition-Trend Analysis bird survey conducted in Spring of 1991 and 1992 are marked with an asterisk (*). Class A Neotropical migrants are marked with an (A) and class B Neotropical migrants are marked with a (B). Class A Neotropical migrants are those species that breed in North America and spend their nonbreeding period primarily south of the U.S. Class B Neotropical migrants are those species that breed and winter exclusively in North America, but some populations winter south of the U.S. Sources identified were used in assessing impacts.

Projected impact on the *species* is noted on a scale which ranges from +++ (very beneficial) through 0 (zero, where no measurable change is anticipated) to - - - (very detrimental). Comparisons are to current levels of use.

Species	Alt 1	Alt 2	Alt 3A	Alt 3B	Alt 4	Alt 5	Alt 6	Source(s):
Ruby-throated hummingbird *A	++	++	+	+	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Broad-winged hawk *A	- - -	- - -	-	- -	0	+	++	Shugart et al., 1978 Hamel et al., 1982
Chuck-will's widow *A	- - -	- - -	-	- -	0	+	++	Shugart et al., 1978 Hamel et al., 1982
Chimney swift *A	++	++	+	+	0	0	0	Peterson, 1980
Common nighthawk *A	++	++	+	+	0	0	0	Peterson, 1980
Yellow-billed cuckoo *A	-	-	0	-	0	+	++	Shugart et al., 1978 Hamel et al., 1982
Eastern wood-pewee *A	- - -	- - -	-	- -	0	+	++	Shugart et al., 1978 Hamel et al., 1982
Prairie warbler *A	++	++	+	+	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Chestnut-sided warbler *A	++	++	+	+	0	0	0	Shugart et al., 1978 Hamel et al., 1982
American swallow-tailed kite *A	0	0	0	0	0	+	++	Peterson, 1980
Acadian flycatcher *A	-	-	0	-	0	+	++	Shugart et al., 1978 Hamel et al., 1982
Common yellowthroat *A	-	-	0	0	0	+	++	Peterson, 1980
Blue grosbeak *A	++	++	+	+	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Barn swallow *A	+	+	0	+	0	0	0	Peterson, 1980
Wood thrush *A	-	-	0	-	0	++	++	Shugart et al., 1978 Hamel et al., 1982

Species	Alt 1	Alt 2	Alt 3A	Alt 3B	Alt 4	Alt 5	Alt 6	Source(s):
Yellow-breasted chat *A	++	++	+	-	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Northern oriole *A	-	-	0	-	0	+	++	Shugart et al., 1978 Hamel et al., 1982
Orchard oriole *A	++	++	+	+	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Mississippi kite *A	- -	- -	-	-	0	+	++	Peterson, 1980
Swainson's warbler A	-	-	0	-	0	+	++	Shugart et al., 1978 Hamel et al., 1982
Great crested flycatcher *A	- -	- -	-	-	0	+	++	Shugart et al., 1978 Hamel et al., 1982
Kentucky warbler A	-	-	0	-	0	+	++	Shugart et al., 1978 Hamel et al., 1982
Indigo bunting *A	++	++	+	+	0	0	0	Peterson, 1980
Summer tanager *A	- - -	- - -	-	- -	0	+	++	Shugart et al., 1978 Hamel et al., 1982
Blue-gray gnatcatcher *A	-	-	0	-	0	+	++	Shugart et al., 1978 Hamel et al., 1982
Purple martin *A	+	+	0	+	0	0	0	Peterson, 1980
Prothonotary warbler A	++	++	+	+	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Bank swallow A	-	-	0	0	0	+	++	Peterson, 1980
Chipping sparrow *A	++	++	+	++	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Northern rough-winged swallow A	-	-	0	0	0	+	++	Peterson, 1980
/Eastern kingbird *A	++	++	+	+	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Yellow-throated vireo A	++	++	+	+	0	0	0	Shugart et al., 1978 Hamel et al., 1982
White-eyed vireo *A	++	++	+	++	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Red-eyed vireo *A	-	-	0	-	0	+	++	Shugart et al., 1978 Hamel et al., 1982
Hooded warbler *A	-	-	0	-	0	+	++	Shugart et al., 1978 Hamel et al., 1982
Red-winged blackbird *B	+	+	0	0	0	0	0	Peterson, 1980
Red-tailed hawk *B	+	+	0	0	0	0	0	Palmer, 1988 Hamel et al., 1982
Red-shouldered hawk *B	-	-	0	0	0	+	++	Palmer, 1988 Hamel et al., 1982
American goldfinch B	++	++	+	++	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Turkey vulture *B	+	+	0	0	0	0	0	Palmer, 1988 Hamel et al., 1982
Hermit thrush B	- - -	- - -	-	- -	0	+	++	Shugart et al., 1978 Hamel et al., 1982

Species	Alt 1	Alt 2	Alt 3A	Alt 3B	Alt 4	Alt 5	Alt 6	Source(s):
Brown creeper [B]	- - -	- - -	-	- -	0	+	++	Shugart et al., 1978 Hamel et al., 1982
Belted kingfisher [B]	-	-	0	0	0	+	++	Peterson, 1980
Killdeer [B]	+	+	0	+	0	0	0	Peterson, 1980
Northern flicker *[B]	++	++	0	+	0	0	0	Shugart et al., 1978 Hamel et al., 1982
American kestrel *[B]	++	++	0	+	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Loggerhead shrike *[B]	++	++	+	+	0	0	0	Peterson, 1980
Northern mockingbird *[B]	++	++	0	+	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Brown-headed cowbird *[B]	+++	+++	+	+	0	0	0	Peterson, 1980
Rufous-sided towhee *[B]	++	++	0	+	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Ruby-crowned kinglet [B]	- - -	- - -	-	-	0	+	++	Peterson, 1980
Eastern phoebe [B]	++	++	+	+	0	0	0	Peterson, 1980
Eastern bluebird *[B]	++	++	+	+	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Eastern meadowlark *[B]	++	++	+	+	0	0	0	Peterson, 1980
American robin [B]	+	+	0	0	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Mourning dove *[B]	++	++	0	+	0	0	0	Shugart et al., 1978 Hamel et al., 1982
White-throated sparrow [B]	++	++	+	+	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Bachman's sparrow *	++	++	+	++	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Wood duck *	-	-	0	0	0	+	++	Shugart et al., 1978 Hamel et al., 1982
Mallard	-	-	0	0	0	+	++	Peterson, 1980
Great blue heron *	-	-	0	0	0	+	++	Peterson, 1980
Cattle egret *	-	-	0	0	0	+	++	Peterson, 1980
Green-backed heron *	-	-	0	0	0	+	++	Peterson, 1980
Common snipe	-	-	0	0	0	+	++	Peterson, 1980
Northern cardinal *	++	++	+	+	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Great egret *	-	-	0	0	0	0	0	Peterson, 1980
Northern bobwhite *	++	++	+	+	0	0	0	Shugart et al., 1978 Hamel et al., 1982

Species	Alt 1	Alt 2	Alt 3A	Alt 3B	Alt 4	Alt 5	Alt 6	Source(s):
American crow *	++	++	+	+	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Fish crow *	-	-	0	0	0	+	++	Peterson, 1980
Blue jay *	++	++	+	+	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Yellow-rumped warbler	- - -	- - -	-	- -	0	0	0	Peterson, 1980
Pine warbler *	- - -	- - -	-	- -	0	+	0	Shugart et al., 1978 Hamel et al., 1982
Pileated woodpecker *	- - -	- - -	-	- -	0	+	0	Shugart et al., 1978 Hamel et al., 1982
Little blue heron	-	-	0	0	0	+	++	Peterson, 1980
Least bittern	-	-	0	0	0	+	++	Peterson, 1980
Red-bellied woodpecker *	- - -	- - -	-	- -	0	+	0	Shugart et al., 1978 Hamel et al., 1982
Red-headed woodpecker *	+	+	0	+	0	0	+	Shugart et al., 1978 Hamel et al., 1982
Wild turkey *	+	+	0	0	0	+	+	Peterson, 1980
Yellow-crowned night heron	0	0	0	0	0	+	++	Peterson, 1980
Eastern screech-owl	++	++	+	+	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Tufted titmouse *	- -	- -	0	-	0	+	++	Shugart et al., 1978 Hamel et al., 1982
Carolina chickadee *	- - -	- - -	-	- -	0	+	++	Shugart et al., 1978 Hamel et al., 1982
Downy woodpecker *	- - -	- - -	-	- -	0	+	++	Shugart et al., 1978 Hamel et al., 1982
Hairy woodpecker *	- - -	- - -	-	- -	0	+	++	Shugart et al., 1978 Hamel et al., 1982
Common grackle *	++	++	+	+	0	0	0	Peterson, 1980
White-breasted nuthatch	- -	- -	0	-	0	+	++	Shugart et al., 1978 Hamel et al., 1982
Brown-headed nuthatch *	- -	- -	-	- -	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Field sparrow *	++	++	+	+	0	0	0	Peterson, 1980
Barred owl *	-	-	0	-	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Carolina wren *	++	++	+	+	0	0	0	Shugart et al., 1978 Hamel et al., 1982
Brown thrasher *	++	++	+	+	0	0	0	Shugart et al., 1978 Hamel et al., 1982

Additional Sources:

Weatherford McDade, Ltd. 1990. Camp Shelby Environmental Impact Statement. Appendix 10-5, Table E, Pages 10-336 to 10-341.

Shugart, H. H., T. M. Smith, J. T. Kitchings, and R. L. Kroodsma. 1978. The relationship of nongame birds to southern forest types and successional stages. In Proceeding of the workshop management of southern forests for nongame birds. U.S Forest Service *General Technical Report SE-14.* Pages 5-16.

Peterson, R. T. 1980. Peterson Field Guides: Eastern Birds. Houghton Mifflin Company, Boston. 384 P.

Palmer, R. S. 1988. Handbook of North American Birds. Yale University Press, Vol. 5, 465 P.

Johnson, M. K. 1987. Inventory of Mammals and Birds on Bigfoot and Aireyu Grazing Allotments of the De Soto National Forest, Mississippi. Pages 165-170 In Ecological, Physical and Socioeconomic Relationships within Southern National Forests. USDA, Forest Service, Southern Experiment Station *General Technical Report SO-68.* 293 P.

Hamel, P. B., H. E. LeGrand, Jr., M. R. Lennartz, and S. A. Gauthreaux, Jr. 1982. Bird-habitat relationships on southeastern forest lands. U.S. Forest Service *General Technical Report WE-22.* 417 P.

Banks, R. C., R. W. McDiarmid, and A. L. Gardner. 1987. Checklist of Vertebrates of the United States, the U.S. Territories, and Canada. U.S. Fish and Wildlife Service, Resource Publication. 166. 79 P.

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At Fort Hood, Texas, small-mammal populations exhibited a shift in species composition and relative abundance, but the total estimated biomass did *not* differ appreciably between tracked vehicle maneuver and controlled areas. At Forts Knox (Kentucky) and Lewis (Washington), there was a negative impact on small mammal species abundance and total estimated biomass when areas were prepared for tracked vehicle training, and severe impacts on those areas when used extensively and over a long period of time for most species (Severinghaus et al., 1979). Members of the mammalian genus *Peromyscus* (white-footed mice and deer mice in particular) consistently increased in abundance in response to habitat disturbance, while the majority of mammalian species decreased in abundance to varying degrees. The results from these three studies suggest that, in general, small mammal and avian populations exhibited an *overall* reduction in total biomass accompanied by a change in species diversity in response to tracked vehicle activity (Goran et al., 1983).

Small mammal and bird populations in the proposed training areas and corridors on Camp Shelby will likely be impacted in a similar fashion to that described above. However, estimates of avian and small-mammal biomass reductions of 20 to 40 percent cannot be extrapolated to Camp Shelby, as these estimates were based on site-specific control plots and a combination of abiotic and biotic factors unique to those installations. The designation of additional tracked vehicle maneuver (T) areas on Camp Shelby will likely impact resident small mammal and bird populations in those areas in a similar fashion described above, but continued monitoring would be required to substantiate this. Conversely, some existing tracked vehicle areas would be turned back to non-tracked vehicle areas and normal U.S. Forest Service management under each of the action alternatives. The cessation of tracked vehicle activity in these areas should increase the vegetative ground cover in the relative short-term, thereby increasing faunal biomass to levels comparable in similar habitats that are not tracked. Noticeable shifts in species composition, however, may be apparent only in the

long-term when woodland species gradually increase and edge-adapted species gradually decrease in abundance in response to a decrease in soil disturbance, forest maturation, and an expected general increase in woody overstory cover.

Further discussion regarding the potential effects from military activities on wildlife in general can be found in Section 4.5.3.2 of the Camp Shelby Final Environmental Impact Statement (Weatherford McDade Ltd., 1991).

3.3.2.4.2 Impacts from Proposed Facilities

A detailed discussion of the following proposed facilities, construction activities, estimated intensities of use, and potential locations can be found in Section 1.2 of this document. Specific impacts to wildlife are discussed below.

Automated Tank Table VIII (ATT VIII): Training mission alternatives that are consistent with the construction of Tank Table VIII facility (Alternatives 1-5) will impact some wildlife in localized areas. Most resident wildlife would not be impacted to a greater degree than at present, as this is primarily an upgrade of an existing range. Approximately 32 acres of very scattered 60 year-old longleaf pine is expected to be cleared. Due to its proximity to the range, the U.S. Forest Service classifies this timber as potentially contaminated with metal. Little true forest interior habitat is found at this location, because of the wide tree spacing, averaging 5 to 6 per acre. Thus, reduction of potential habitat for species preferring forest interior conditions is minimal. Some additional permanent loss of habitat will result from the small-scale earth moving activities to build new targets. Wildlife adjacent to these target sites may be displaced to other areas, many of which should return after construction activities cease. The area is predominantly open grassland, and will remain as such after facility completion, therefore, no noticeable changes in species composition or abundance is expected. Additional impacts to wildlife may result from the minor timber removal required to create new roads and upgrade existing roads and facilities.

Multiple Purpose Range Complex-Heavy (MPRC-H):

- Preferred Site -- The Multiple Purpose Range Complex-Heavy (MPRC-H) facility is proposed for Alternatives 1, 2, 3A, 3B, and 5. Although three-eighths of the lanes will be overlaid on an existing range, impacts to some resident wildlife from timber removal, earth-moving, road building, and other construction activities will result. Approximately 500 acres of longleaf pine, the great majority of which is 30 years old or less, is expected to be cleared with an additional 500 acres (estimated) of other stand types to be cleared. Clearing this relatively young timber will not directly impact species requiring mature longleaf, but will slightly reduce the total amount of habitat available in the future. Some wildlife in the construction sites will be permanently displaced to adjacent areas, or their use of the site severely reduced. Those species tolerant of (or dependent on) human and/or environmental disturbance will likely increase use of the area. Many members of the family Corvidae include species with predatory tendencies that frequently occupy open or disturbed habitats. Consequently, species occupying stands adjacent to and within the preferred site may be

subjected to increased rates of nest predation (e.g., from blue jays, coyotes, and skunks) and nest parasitism (e.g., from brown-headed cowbirds).

One forested area between two of the proposed firing/travel lanes (Figure 3-21) will be relatively long and narrow, and from an ecological standpoint would likely be transformed into an edge community. In addition to the direct impacts resulting from the timber removal, wildlife inhabiting the forest between and adjacent to the firing lanes will be subjected to increased rates of predation, nest parasitism, noise disturbance, smoke and other by-products of training exercises. Direct impacts to wetlands will again be avoided except to create or modify existing crossings, but wildlife inhabiting them will nevertheless be subjected to increased disturbance and predation due to their close proximity.

- Alternate Site -- Construction at this site would require timber clearing, earth-moving, and road building activities similar to the preferred site but to a lesser degree. An existing drop zone on the site would be utilized, thus reducing the land and timber alteration activities. Impacts to wildlife, excluding threatened, endangered and sensitive (TE&S) species which are discussed in Section 3.3.2.5.2, are similar to those described in the preferred site.

Automated Tank Wash Facility: Sites 1 and 2 -- Both the preferred site (69 acres) and the alternative site (89 acres) will require most of the timber and undergrowth be cleared followed by extensive earth-moving activities to prepare the site. Displacement of the more mobile resident wildlife to other areas will occur and will likely be permanent. The area will have limited value to most species after facility completion, as much of the developed site will remain free of vegetation. Wildlife occupying these sites will be affected by construction activities, and while the loss of habitat is quite small relative to the permit area, it does contribute to the overall action.

Explosive Ordnance Disposal (EOD) Facility:

- Sites 1 and 2 -- Both sites are relatively small, and are accessible using existing trails. The primary physical changes to the site will be to clear and level a site about 1-2 acres in size, and to remove most of the vegetation. Impacts to wildlife will result from the loss of herbaceous cover, nesting sites, and surface and sub-surface food reserves, a portion of which will be permanent. Many resident wildlife will be displaced to adjacent areas during construction activities, and further use of the area will be reduced. Maintaining a slightly more permanent open area will favor grassland species slightly more than edge or open-forest species after the permanent grass cover is re-established on portions of the site. Impacts to wildlife from the noise generated from the occasional detonation of ordnance are not thought to be significant. Both EOD sites are within the existing impact area (for discussion on buffer areas around existing impact areas, see Sections 1.3.4 and 2.1.2.1). Wildlife have likely become habituated to the noise (see Section 3.1.5.4).

Combined Arms Live Fire Exercise Assembly Areas (CALFEX-AA): Each site encompasses approximately 25 acres and would primarily involve the upgrading of one existing trail in each area (running along the long-axis) to 16 feet in width, and graveled and/or modified to

support tracked vehicles. An estimated 8-22 acres of timber (total) is expected to be cleared, most of which is 60-70 year old longleaf. Soil compaction, erosion and subsequent loss of vegetative ground cover associated with tracked vehicle maneuver areas (Goran et al., 1983) will be concentrated in those areas immediately adjacent to the trail. A localized and relatively small reduction in surface and sub-surface food resources (a result of soil disturbance) could be expected along with a correspondingly small reduction in small mammal abundance. Bird species feeding at or near ground level likely would reduce their use of the area during periods with troop activity, and possibly during non-use periods. This reduction is expected because troops tend to cut woody understory vegetation for concealment purposes, and over the years will likely reduce the amount of shrub and small tree cover found attractive to many wildlife species.

Tactical Aviation Training Areas (TAAs): Modifications to the sites (only four will be modified) would involve the clearing of vegetation and earth-moving activities to achieve a 0-6 percent slope. Impacts to wildlife from these activities are a reduction in woody and vegetative cover, disturbance of the food resources and burrow systems occurring on the soil surface and in the upper soil layers. Wildlife within 100 meters of the aviation sites will be subjected to a greater level of military activity and noise than at present. As helicopters tend to be more disturbing to wildlife than other aircraft, frequent helicopter movements in relatively small areas have the potential for a variety of negative impacts, including a reduction in use of the areas or decreased productivity with respect to breeding birds that do use the area. Please see Section 3.1.5.4 for a more in-depth discussion on the effects of noise on wildlife. Other known impacts to wildlife will be the displacement of many individuals to other areas during times of military activity. An increase in edge will favor edge-adapted species or those tolerant of disturbance.

3.3.2.4.3 Impacts by Alternative

A discussion of the following six mission alternatives can be found in Chapter 1 of this document. Mission impacts as they pertain to wildlife, excluding threatened, endangered and sensitive (TE&S) species, are addressed below.

Training with Provision for New Battalion Task Force Training Area *(Alternative 1)*: All of the proposed facilities (1-6) would be constructed in this alternative. Potential impacts to wildlife are greater in this alternative than for any other, simply due to the size of the area involved. The majority of non-maneuverable acreage within the tank corridor and maneuver areas are wetlands, TE&S species areas, or riparian buffer zones and will remain off-limits to tracked vehicle activity because of their ecological importance. However, some unavoidable sub-grade disturbance to a relatively small number of affected wetlands is expected during the construction of new crossings, and to a lesser degree in the improvement of existing crossings. An estimated minimum of 91 acres of altered wetland crossings is expected with this alternative to maintain the integrity of the wetlands while providing realistic training conditions. Potential negative impacts to wildlife from this alternative may be primarily attributed to the surface and sub-surface modifications, if any, to the above mentioned wetland sites. Construction activities likely will increase the quantity of suspended sediments

in the water for a short time. Wetland plant species particularly sensitive to mechanical damage (e.g., from vehicles) may be slow to recover or re-establish themselves, thus influencing the faunal element to some extent. Many resident wildlife (e.g., herons, rail, raccoon, mink, and waterfowl) in affected wetlands will be temporarily displaced to other sites, while the more secretive species (e.g., bobcat) might reduce their use to a greater degree. The proposed mitigation measure of enforcing a 100-foot buffer around each wetland will help reduce some but not all of these impacts. When considering the relatively small size of each crossing (generally less than 1 acre), this emigration to other sites is not likely to exceed the land's capacity to support them. Lastly, careful placement of the new wetland crossings (locations have not been finalized) may eliminate or reduce certain negative site-specific consequences mentioned above.

In terms of positive impacts, the opening of the pine overstory will favor the continued growth of existing mast-producing hardwoods and small shrubs, benefitting many game species such as turkey, squirrel, rabbit, and deer in addition to a number of non-game mammalian and avian species. The tops of trees left after tree removal operations will provide immediate but temporary cover and perching sites for many species. Providing sufficient game numbers and hunting opportunities for the military and civilian communities on Camp Shelby is a concern of the Mississippi Army National Guard, the U.S. Forest Service, and the Mississippi Department of Wildlife, Fisheries and Parks. Most of proposed training area (PTA) 1 and PTA 2 are within the Leaf River Game Management Area, and recreational use of this area could increase as roads are improved and trails upgraded in areas limited to foot traffic, but not vehicular access. Since military activities in general did not disturb recreationists (Camp Shelby Recreation Use Study 1990, Appendix F), and since the primary recreational activity on Camp Shelby is hunting, increased access will undoubtedly increase the hunting pressure and subsequent impact on some game species. The following discussion addresses the potential impacts on some game species of this improved access. Rose (1977) reported that the annual mortality rate of an adult cottontail rabbit (*Sylvilagus floridanus*) population in Illinois was slightly greater in years when there was hunting (0.84) when compared to years when no hunting was allowed (0.75). However, Rose (1977) also found that fall populations were not correlated with hunting the preceding year, and the increased production or survivability of young apparently compensated for the increase in adult mortality resulting in fairly consistent population levels over the years. Hunting pressure aside, rabbits and other wildlife will be subjected to higher mortality from vehicles as they attempt to cross the relatively wide corridors and the proposed trails. For edge tolerant species with a high reproductive potential, such as rabbits, any increase in mortality is not expected to negate the expected gains in abundance. White-tailed deer, turkey and rabbits tend to feed most often in the more open areas between dusk and dawn, and while proposed tracked and vehicular activity will occur during these times, it should occur less often relative to the daylight hours.

The impact on the white-tailed deer population in these areas is difficult to quantify, as accurate records of current hunter visitation and harvest levels by training area are not maintained. Deer in other regions have tended to respond to intensive hunting by altering their normal daily movement patterns or shifting their seasonal home ranges (Root et al.,

1988; Pilcher and Wampler, 1982). Large-scale timber removal will improve the visibility of deer to hunters, making some game species more vulnerable to hunters. Whether or not this vulnerability translates into higher buck mortality (and exacerbate the buck/doe imbalance typically associated with bucks-only regulations) depends largely on the size, shape, and juxtaposition (distance between) of the fragments of trees remaining after timber removal and the completion of construction projects. Adjusting the harvest regulations (e.g., issuing doe-only permits in certain areas) is one of a number of options to help correct an imbalance in the buck/doe ratio.

Hunter distribution within the Leaf River Wildlife Management Area and PTA 3 may also be influenced by the improved access within these areas. Those hunters preferring to hunt (or restricted to because of physical disabilities) in fairly close proximity to maintained roads or large clearings will have more locations to choose from once existing trails are upgraded, new roads built, and the maneuvering corridors cleared of pine for the most part. This could have the effect of distributing hunters more evenly over the area. Conversely, the opportunity for a more isolated hunting experience is diminished. Additional discussion on the effects from Alternative 1, in addition to the other alternatives, can be found in Section 3.3.2.6 (biodiversity).

<u>Training with Provision for New Company Team Maneuver Area *(Alternative 2)*</u>: All of the proposed facilities (1-6) would be constructed in this alternative with specific impacts to wildlife being discussed in Section 3.3.2.4.2. Many of the impacts described in the above alternative apply to this alternative as well. However, the major wetland crossing associated with Cypress Creek would be avoided with this alternative. Construction activities adjacent to or within wetland sites, timber removal, and training activities and their subsequent impacts on wildlife are similar, but will occur on a lesser scale because of the slightly smaller training force and area involved. Gross acres under Alternative 2 are approximately 4,000 acres less than Alternative 1. The amount of *trackable* area under Alternative 2 is only 1,500 acres less. This difference is substantial, but when considering other sources of impacts it makes differentiating between Alternatives 1 and 2 more difficult.

The removal of timber within the 400 meter maneuver corridors (maximum) connecting PTA 4 to PTA 2, PTA 2 to PTA 1 (Figure 3-25), and the improvement or construction of roads, would have several impacts on wildlife. Resident species would initially be displaced to other areas, some of which might return, depending upon the degree of structural modifications to the habitat initially, and those resulting from subsequent tracked vehicle activity. A change in species diversity could occur as those species not returning would probably be replaced by those preferring an open canopy and/or tolerant of disturbed environments. The readers are advised to read Section 3.3.2.6 for a more in-depth discussion on the effects to biodiversity.

<u>Training with a Partial Restriction on Maneuver Activities *(Alternatives 3A and 3B)*</u>: All of the proposed facilities (1-6) would be constructed with Alternative 3A and 3B, with the impacts to wildlife discussed in Section 3.3.2.4.2. The restriction of tracked vehicles maneuvering north and west of USFS Route 303 (eight-mile road) would reduce or eliminate

impacts associated with maneuvering activities in existing training areas T-47, T-49, and T-54, but would increase impacts in other areas. Alternatives 3A and 3B would also eliminate any potential negative impacts associated with maneuvering within the Leaf River Game Management Area. For a discussion on the LRWMA please refer to Section 3.3.6. Soil erosion and subsequent loss of vegetative cover and food resources may be expected with increased tracked vehicle use, although mitigation measures and proper training scheduling may reduce this loss considerably. The amount of trackable area, timber clearing, and the permanent edge and open area proposed to be created is greater for Alternative 3B than 3A, and the readers are requested to refer to Section 3.3.2.6 for this discussion.

<u>Training with Current Activities and Facilities *(Alternative 4)*</u>: Impacts to wildlife would be similar to what they are at present (described in Section 3.1.2.4), with the exception of the Automated Tank Wash facility and an explosive ordnance disposal (EOD) Site. Impacts of these facilities on wildlife are discussed in Section 3.4.4.1. Overall, no net change in impacts to wildlife are expected under this alternative, as discussed in Sections 3.1.2.5 and 3.1.2.6.

<u>Training for Unit Field Training and Range and Firing Activities but no Tracked Vehicle Maneuver *(Alternative 5)*</u>: With this alternative, several new facilities would be constructed (1-4). The impacts of these facilities on wildlife are discussed in Section 3.4.4.1. Tracked vehicle maneuvering activities would be eliminated in this option. Positive impacts to the majority of wildlife species are expected from the cessation of maneuvering activities. In general, most species will not be impacted in the short-term. However, as the physical effects of tracked vehicle use are mitigated and the areas returned to normal U.S. Forest Service management, changes in small mammal and avian species relative abundance and an increase in biomass could be expected to occur. Conditions favoring interior and other area-sensitive species may not improve appreciably. Although, as more land is incorporated back into the USFS timber base, portions may be regenerated, resulting in a continuation in the current rate of fragmentation of the general forest area. This alternative allows the U.S. Forest Service more flexibility in management for specific species by keeping open the options available on the current tank maneuver areas. Again, please refer to Section 3.3.2.6 for a more in-depth discussion on biodiversity.

<u>No Action (Issue no Special Use Permit - *Alternative 6*)</u>: The no action alternative would: (1) reduce or eliminate the impacts from military activities, but negative impacts from timber removal (including fragmentation) may continue in lieu of military training with associated positive and negative effects as discussed under Alternative 5 and (2) maintain management options for the various areas previously impacted by military activities. A positive net impact on wildlife habitat could nevertheless be expected, but an increase in biodiversity is questionable. Again, please refer to Section 3.3.2.6 for a more in-depth discussion on the proposed actions and their impacts on biodiversity.

3.3.2.5 Threatened, Endangered and Sensitive Species

3.3.2.5.1 General Impacts

A Biological Assessment is required by the U.S. Fish and Wildlife Service on major construction or other projects having similar physical impacts to the environment (50 CFR Part 402.12, *Federal Register*, June 3, 1986). In addition, Biological Evaluations are conducted by the U.S. Forest Service for proposed programs and activities for possible effects on threatened, endangered, proposed, or sensitive species (U.S. Forest Service Manual 2672.4). According to the U.S. Forest Service Manual (Section 2672.41), there are three primary objectives for the Biological Evaluations. First, "to ensure that U.S. Forest Service actions do not contribute to loss of viability of any native or desired non-native plant, or contribute to animal species or trends toward federal listing of any species". Second, "to comply with the Endangered Species Act and its requirements". Lastly, "...to ensure that threatened, endangered, proposed, and sensitive species receive full consideration in the decision making process".

Thus, prior to the initiation of any new construction or timber removal activities identified in this Final EIS, a site-specific investigation will be conducted, and specific impacts to TE&S species identified. Any potential for impacts would result in either formal or informal consultation with the U.S. Fish and Wildlife Service (USFWS). All training area, travel corridor, and facility boundaries proposed in the DEIS (and subsequent revisions for the FEIS) were developed specifically to avoid gopher tortoise colonies, burrows, and priority soils -- whether or not they are occupied -- to the greatest degree possible. General impacts to threatened, endangered and sensitive species, based on the most recent information available, are discussed below. However, it should also be noted that the Biological Opinion issued to the Forest Service (October 13, 1993) with regard to the issuance of a Special Use Permit to the National Guard Bureau recommended that military training be restricted to currently used areas to prevent potential adverse effects on the recovery of the gopher tortoise. It should be noted that all known red-cockaded (RCW) colony sites on Camp Shelby are inactive.

3.3.2.5.2 Impacts from Proposed Facilities

Automated Tank Table VIII (ATT VIII): The gopher tortoise is the only listed species known to occur on the proposed site. Active gopher tortoise burrows have been discovered in close proximity to both current and proposed target areas (see Figure 3-20). The locations of proposed new roads, improving existing roads, and construction of the staging area have been adjusted to avoid direct conflicts with tortoise colonies or active burrow sites and associated buffer zones when possible. However, in their 1993 biological opinion the U.S. Fish and Wildlife Service (USFWS) will permit the relocation of any gopher tortoise known to occur in the area in order to help protect them from ordnance; therefore, no impacts from the construction or operation of this facility are expected once they are removed from the area. An estimated 62 tortoises may be affected.

Multiple Purpose Range Complex-Heavy (MPRC-H):

- Preferred Site -- Relatively few active gopher tortoise burrows occur on this site, but there is one small colony at the eastern border of the MPRC-H (Figure 3-21). An estimated 25 tortoises will be moved. Negative impacts to the tortoise will be avoided pending their proposed relocation out of the area, as allowed in the latest USFWS biological opinion. No other threatened, endangered, or sensitive species are known to occur on the site.

- Alternate Site -- Eight known gopher tortoise colonies (two of which are relatively large) and five previously used red-cockaded woodpecker colonies occur on this site, in addition to several active, isolated gopher tortoise burrows. The biological assessment on the effects of this action on the gopher tortoise (Wester and Swing, 1992) recommended that the alternative site not be developed. Also, Bachman's sparrow and eastern indigo snake records exist for this site (Figure 3-21). Thus, the potential to affect TE&S species at this site is substantially greater than at the preferred site. No other threatened, endangered, or special interest species are known to occur on the site.

Automated Tank Wash Facility:

- Sites 1 and 2 -- No threatened, endangered, or special interest species have been recorded from either site.

Explosive Ordnance Disposal (EOD) Facility:

- Sites 1 and 2 -- A gopher tortoise colony has recently been identified within the boundary of Site 2, which is expected to render it unsuitable for development purposes. No threatened, endangered, or special interest species are known to occur on Site 1.

Combined Arms Live Fire Exercise Assembly Areas (CALFEX-AA): No threatened, endangered, or special interest species are known to occur on any of the areas, nor do any of the sites occur on priority soils.

Tactical Aviation Training Areas (TAAs):

- Sites 1, 2, and 10 -- Site number 10 overlaps a gopher tortoise colony. The boundary for this site must be adjusted to avoid impacting the gopher tortoise. Approximately 50 percent of Area 1, and nearly 100 percent of Area 2 fall within a 3/4 mile red-cockaded woodpecker (RCW) buffer zone. No other threatened, endangered, or special interest species are known to occur within these areas.

- Sites 3 through 9 -- No threatened, endangered, or special interest species are known to occur in any of these areas.

3.3.2.5.3 Impacts by Alternative

Alternative 1: As per the 1992 and 1993 biological opinions, Alternative 1 could be fully implemented without significant negative impacts to the gopher tortoise. Approximately 4,500 acres of 60-plus year old longleaf will be cleared, reducing the amount of potential red-cockaded woodpecker (RCW) nest trees. Considering the fact that no active RCW colonies are known to occur on either Camp Shelby or elsewhere on the Black Creek Ranger District, the significance of the loss of these trees to the RCW is debatable. No direct impacts to the RCW are expected, however, as the interim guidelines were considered in the design of this action and will continue to be followed.

Alternative 2: As per the 1992 and 1993 biological opinions, Alternative 2 could also be fully implemented without significant negative impacts to the gopher tortoise. There will be nearly 4,400 acres of 60-plus year old longleaf cleared, making Alternatives 1 and 2 virtually the same in terms of their impacts to the RCW and gopher tortoise.

Alternative 3A: As per the 1992 and 1993 biological opinions, Alternative 3A could be fully implemented without significant negative impacts to the gopher tortoise. Few indirect and no direct impacts to the RCW are expected because this alternative contains the fewest inactive RCW colonies, and the interim guidelines will also continue to be followed.

Alternative 3B: As per the 1992 and 1993 biological opinions, Alternative 3B *cannot* be fully implemented without significant negative impacts to the gopher tortoise. This conclusion was made in spite of the current and proposed mitigation efforts, and is largely due to the great density and total number of active burrows.

Alternative 4: Impacts to wildlife and threatened, endangered and sensitive (TE&S) species from current levels of activities have been addressed in Section 3.1.2.5. No significant impacts are expected to TE&S animal species under this alternative.

Alternative 5: Generally, no impacts, positive or negative, are expected to TE&S animal species under this alternative. All management guidelines will continue to be implemented, and no significant negative effects are expected under this alternative.

Alternative 6: Gopher tortoises and the other protected species occurring in the impact area (and its buffer zone) and the large tank safety fan (Figure 2-1) are afforded some degree of protection from civilian disturbance for at least a portion of the year, and would likely be subjected to increased human disturbance, resulting from the military relinquishing control over civilian access to these restricted access areas. However, since quantitative documentation regarding gopher tortoise mortality attributed to civilian versus military sources is lacking, the magnitude of this action and susceptibility (if any) is unknown. Overall, no significant positive or negative impacts to TE&S animal species are expected under this alternative.

3.3.2.6 Biodiversity

General discussion of impacts common to two or more of the alternatives.

To reduce redundancy, the more comprehensive discussions on the impacts to vegetation and wildlife, with attention given to individual species or groups of species, can be found in Sections 3.3.2.1 and 3.3.2.4, respectively. Similarly, while threatened, endangered and sensitive (TE&S) species are crucial factors when considering biodiversity, the primary discussions defer to Sections 3.3.2.1.2 (TE&S plants) and 3.3.2.5 (TE&S wildlife). The majority of the discussion in this section is intended to address broader biodiversity issues isolated to the proposed actions, including the creation of permanent open areas and edge, the potential loss of plant community diversity due to the proposed clearing, forest fragmentation, and other identified impacts on biodiversity.

Alternatives 1, 2, 3A and 3B all involve the clearing or thinning of timber to develop the proposed corridors and training areas. It is reasonable to assume the U.S. Forest Service (USFS) management practice of periodically regenerating the forest by removing all (clear-cut), or a majority of the trees in a defined stand, will continue. In both cases, a short-term impact will be that of fragmenting a once contiguous stand of forest. However, unlike the USFS regeneration cycle, the implementation of each action alternative would result in *maintaining* the cleared areas. This additional permanent open area and edge would represent a decrease in habitat for forest interior species. This is a potentially important impact if stands of mature longleaf forest continue to decline in Mississippi.

A growing number of researchers are providing evidence that forest fragmentation and the man-induced creation of open areas has allowed predatory species, nest parasitizers, and other edge species to benefit at the expense of forest interior and area sensitive species (Brittingham and Temple, 1983; Wilcove, 1985; Yahner and Scott, 1988; Finch, 1991; Nigh et al., 1992), many of which are neotropical migrants. While the majority of the published studies were not conducted in the longleaf pine region, they provide evidence to support the viewpoint that the potential for a similar scenario to occur on Camp Shelby from the proposed actions is reasonably good. Not only will the proposed corridors and proposed training areas (PTAs) provide favorable feeding habitat and avenues of dispersal for edge associated species, but the habitat modifications will also reduce or possibly eliminate their use by species requiring contiguous tracts of forest.

The proposed clearing of forest will obviously change many visual characteristics of the plant community in the cleared areas, but will also influence the plant and animal communities in the forested areas immediately bordering the cleared areas (PTAs and corridors). The impact of this community alteration on wildlife species in some cases depends on the age of trees to be removed. For example, the red-cockaded woodpecker typically constructs nest cavities in longleaf pine and other southern yellow-pine species which are a minimum of sixty years old, although no active colonies have been recorded on Camp Shelby since the 1990 nesting season (Schnell, 1991). Thus, the removal of 60-plus year old longleaf would immediately

reduce the amount of potentially available nest cavity trees, whereas the removal of 10 or 20 year old longleaf would not immediately reduce woodpecker nesting habitat.

The pre-settlement condition consisted of mixed aged trees, some of which may have exceeded 300 years in age, but unfortunately it is not known what percentage of the trees would have been 60-80 years or older. Thus, while it is not possible to accurately quantify how representative Camp Shelby is of the pre-settlement longleaf pine ecosystem, one thing that is clearly deficient are longleaf pine exceeding 100 years. In order to help differentiate the action alternatives, an emphasis has been placed on the 60-80 year old stands, as they have the potential to reach old-growth status first. Longleaf pine of all age classes are essential for ecosystem health, although there appears to be a shortage of age-classes originating in the 1940's and 1950's on Camp Shelby as in the rest of the De Soto National Forest.

Snags (standing but dead trees) are discussed in Section 3.1.2.4, but their significance regarding biodiversity warrants discussion under this section also. Snag density throughout the Black Creek Ranger District, of which Camp Shelby was included, was last estimated to *average* one snag per acre, with a USFS management objective of two or more snags per acre (J. White, personal communication, 1993). Davis (1983) is one of many researchers reporting the importance of snags to local diversity and their utilization by numerous wildlife for a variety of functions. Scott (1979) found that in Arizona when snags were removed from ponderosa pine habitat, bird densities decreased 27 percent and cavity nesters exhibited a 51 percent decrease. Somewhat expectedly, Scott (1979) also reported overall increases in bird abundance in areas adjacent to the clear-cuts. The loss of one snag per acre can influence biodiversity within that acre, but the cumulative effect of all the acres has the potential of influencing diversity on a much broader scale. The snag-associated species are potentially subjected to greater direct negative impacts (in the absence of mitigation) from a reduction in snags. The red-headed woodpecker, red-bellied woodpecker, wood duck, screech owl, common flicker, downy woodpecker, great crested flycatcher, tufted titmouse, white-breasted nuthatch, and brown creeper are just a few of these snag-associated species occurring on Camp Shelby.

Birds nesting within and adjacent to newly created edge may be subjected to greater egg and pre-fledgling predation rates than previously experienced as avian (e.g., american crow and blue jay), mammalian (e.g., raccoon, coyote, gray and fox squirrels, chipmunk, striped skunk, gray and red foxes), and reptilian (e.g., snakes) predators tend to do well in edge habitats. Wilcove (1985) inferred from the research of others that, at least for the northeast, resident birds often built nests higher off the ground or utilized tree cavities in an attempt to reduce predation. Conversely, the tendency of neotropical migrants to build open cup nests or construct nests very near to or on the ground makes them especially vulnerable to nest predation and brood parasitism (Brittingham and Temple, 1983; Finch, 1991).

The brown-headed cowbird is a brood parasite that presently occurs on Camp Shelby in relatively low numbers. Based on land condition trend analysis (LCTA) data, brown-headed cowbirds were observed only ten times from 60 surveyed sites. We note that this species can

be secretive and somewhat more difficult to document than other songbirds, so abundance data should be viewed with some caution. The brown-headed cowbird is an obligate brood parasite, that is, they are completely dependent on one or more host bird species to incubate and rear their young. The proposed creation of permanently cleared/thinned corridors through forested areas may increase the potential that a greater proportion of neotropical migrant nests will be parasitized by the brown-headed cowbird. Neither the present extent, nor the magnitude of change may be quantified at present.

As a means to quantitatively differentiate Alternatives 1 through 3B, the amount of open area was calculated. Open land acreage was calculated from Geographic Resources Analysis Support System (GRASS) forest-stand and age-class maps (USFS data) and road maps (MS Army National Guard or MSARNG data) as the sum of grasslands, forest stands less than ten years old, and all roads (a 100-foot buffer centered over every road). The amount of open area for the entire Camp Shelby permit area is estimated to be 32,371 acres, or approximately 23 percent of the total area. Based on the most current data set available, the amount of edge for the entire permit area is grossly estimated at 1,252 miles. Alternatives 4 and 5 will increase these figures slightly as the proposed facilities are constructed, but the amount of open area and edge should remain comparable to that at present. Table 3-28 illustrates the amount of open area currently existing within the alternative boundary, the amount expected, and the percent change. The readers are reminded that estimates of open area and edge are given primarily to help differentiate the alternatives. The scale and accuracy of the maps used, and the issue of what to call "edge" necessitated the use of a relatively gross analysis. Because additional stands have been cleared throughout the permit area since the figures were calculated, the estimates have changed slightly.

Table 3-28

Percent change between the amount of land that is currently identified as open to that which is proposed to be open. The definition of "open" is provided in the preceding paragraph.

Open Land	Alternative 1 Acres	%	Alternative 2 Acres	%	Alternative 3A Acres	%	Alternative 3B Acres	%	Alternative 4 Acres	%
Present	7,111	22.0	5,404	16.7	3,336	10.3	4,822	14.9	14,809	90.0
Proposed	18,224	56.3	15,060	46.5	5,747	17.8	6,841	21.1	14,801	90.0
% Change	+156.3		+178.7		+72.3		+41.9		0	

Related to how much open area would exist with each action alternative is the amount of edge created from the establishment of the corridors and PTAs. Table 3-29 represents the linear miles of perimeter (edge) that is estimated to be created for each corridor and grouped by alternative, acknowledging the conceptual nature of the proposed actions. The amount of new edge within each PTA was estimated from the perimeter of the areas proposed to be cleared. Not only is the amount of permanent open area a consideration, but the ratio of open area to edge is also important. For example, edge associated species would benefit more on a 500 acre grassland with 10 miles of edge than a 500 acre grassland with 5 miles of edge.

Conversely, species associated with open grasslands potentially could benefit more if more open areas were created relative to the amount of edge already available. Hanson and others (1991) cite a study in the Pacific Northwest in which 22 percent of the bird species sampled had higher densities in clear-cut interiors than at clear-cut edges. This same situation may occur at Camp Shelby, with some of the existing edge being removed as appropriate areas are cleared, and removing some of the smaller, more isolated fragments, in favor of retaining larger, connected stands.

Table 3-29

Percent change between the linear miles of edge that is currently identified to the linear miles of edge proposed to be created, incorporating appropriate training areas and corridors.

Edge	ALT 1	ALT 2	ALT 3A	ALT 3B	ALT 4
Present	313.0	281.7	105.4	201.8	167.8
Proposed	612.0	541.2	175.7	351.1	167.8
% Change	+95.5	+92.1	+66.7	+74.0	0

With Alternatives 1 through 3B, a number of presently forested tracts will be fragmented by proposed clearing (see Figure 3-22 for example). In very general terms, MacArthur and Wilson's (1967) theory of island biogeography states that large islands tend to have more species than smaller ones, large islands have higher immigration and lower extinction rates than smaller islands, and islands close to the mainland tend to have more species than islands farther away (more isolated). MacArthur and Wilson's (1967) theories, which have direct relevance to biodiversity, can perhaps be used to quantify the effects on the plant and animal species within forest fragments left as a result of the proposed clearing and thinning at Camp Shelby. However, in their discussion on forest fragmentation and island biogeography, Rosenfield and others (1992) point out that substantial differences exist between true islands and forest fragments, and question the degree to which MacArthur and Wilson's (1967) island theories can be applied to terrestrial systems.

Forest fragmentation continues to be an issue among biologists. If large fragments of forest are more likely to contain the conditions and species assemblages characteristic of pre-settlement longleaf communities than are small fragments, then changes may be expected, as size decreases. Based on this assumption and the conceptual nature of the proposals, the alternatives can be differentiated to a degree, but an accurate quantification of immigration or emigration rates and indigenous species richness estimates within any forest fragments would be difficult to determine.

Fragmenting the forest will have different effects on different species. Wide-ranging mammalian species such as the black bear and bobcat tend to avoid roads and areas of high human disturbance. Although their use at Camp Shelby appears to be limited at present, the creation of extensive open areas may further reduce their presence and use. As another means of differentiating the alternatives and attempting to quantify fragmentation, the number and average size of these fragments was estimated, again understanding that the proposed actions are still conceptual in nature. Most of the identified fragments are not "islands", but are more often proposed to be cleared on three sides. In any case, these semi-isolated forest stands represent a substantial departure from existing contiguous forests and were thus classified as "fragments."

3.3.2.6.1 Discussion of Impacts by Alternative

Alternative 1: Alternative 1 will result in an estimated 156 percent increase in open area (Table 3-28) and a 96 percent increase in edge within the proposed maneuver areas and corridors (Table 3-29). Potentially, there could be 15 forest fragments resulting from the clearing of timber for the corridors and within the proposed training areas (PTAs). The total acres to be cleared among the 15 fragments will average approximately 986 acres each. More importantly, however, the edge to interior ratio of the fragments is estimated to be 1/124. In other words, for every mile of edge there will be 124 acres of interior forest. The four largest fragments average 2,792 acres each (interior to edge ratio of 1/202) and are located between PTAs 1 and 2 and PTAs 2 and 3, and bordered on the east and west by their associated corridor sets.

Table 3-30 lists the nineteen identified forest communities that exist within the area under Alternative 1. Some of these communities are small and are not as likely to contain the assemblage of species and characteristics representative of pre-settlement conditions, but for comparative purposes are assumed to be functional communities. Slash pine-hardwood, slash pine, shortleaf pine, southern red oak-yellow pine, and white oak-black oak-yellow pine stands all would be reduced by 50 percent or more under this alternative. None of the stand types are proposed to be completely cleared, but substantial reductions (52-79%) would decrease the probability that remaining fragments would contain species representative of pre-settlement times, or that they would remain functional. The yellow pine stand type is a U.S. Forest Service term referring to the mixture of any combination of the different southern pine types that occur with hardwoods (J. White, personal communication, 1993).

Table 3-30

Total acres present within each stand type relative to the acres proposed to be thinned and cleared, incorporating appropriate training areas and corridors. The acres that remain after subtracting thinned and cleared acres from present acres will be left unchanged.

Alternative 1	Present	Thinned	% Thinned	Cleared	% Cleared
Total Acres	35,512	5,916	16.7	14,439	42.0
No Data	1	0	0	0	0
Loblolly Pine-Hardwood	523	19	3.6	124	23.7
Slash Pine-Hardwood	88	0	0	50	56.8
Longleaf Pine	18,820	3,861	20.5	7,761	41.2
Slash Pine	6,337	646	10.1	3,338	52.7
Loblolly Pine	1,684	468	27.8	645	38.3
Shortleaf Pine	390	4	1.0	256	65.6
Southern Red Oak-Yellow Pine	238	22	9.2	188	79.0
Bottomland Hardwood-Yellow Pine	1,683	250	14.9	538	32.0
Post Oak-Black Oak	29	0	0	0	0
White Oak-Black Oak-Yellow Pine	379	91	24.0	288	76.0
White Oak-Red Oak-Hickory	259	39	15.1	90	34.8
White Oak	64	1	1	0	0
Yellow Poplar-White Oak-Red Oak	58	51	87.9	7	12.1
Scrub Oak	10	10	100.0	0	0
Sweet Gum-Yellow Poplar	184	14	7.6	51	27.7
Sweet Gum-Nuttall Oak-Willow Oak	1,121	120	10.7	218	19.4
Willow Oak-Laurel Oak	289	41	14.2	35	12.1
Sweetbay-Swamp Tupelo-Red Maple	2,182	168	7.7	472	21.6
Undrained Flatwoods	27	0	0	10	35.7
Open / Firing Points	69	13	18.8	51	73.9
DOD	1073	98	9.1	818	76.2

Longleaf pine, slash pine and sweetbay-swamp tupelo-red maple are the three predominant forest types in the areas affected by this alternative, and account for 53 percent, 18 percent

and 6 percent of the forested acres respectively. If the sites are cleared as proposed they will then comprise 31 percent, 8 percent and 5 percent of the total. A relatively small decrease in the bottomland and other poorly drained sites (e.g., the sweetbay-swamp tupelo-red maple community) is expected as military activities largely avoid wetlands except at designated crossings. When considering the approximately 35,500 acres under Alternative 1, longleaf pine would still be the dominant stand type, but would no longer comprise the majority of the forested area.

Overall, 41 percent of the longleaf pine will be cleared and 21 percent thinned. Table 3-31 indicates that approximately 9,849 acres (53%) of the existing longleaf pine is 60-80 years old, and that 4,427 acres (44%) of that total is expected to be cleared, 2165 acres (22%) thinned, and 3,257 acres (33%) left as is. Overall, 28-50 percent of each of the represented age-classes will be cleared, an exception being that none of the 48 acres of 80 year old longleaf will be cleared (75% will be thinned, however).

An initial loss of 15,000 snags (1 per acre of cleared forest) or 42 percent of the total estimated for the areas involved is possible under this alternative. Some of the thinned timber or that which is adjacent to the cleared area will likely be subjected to higher-than-normal

Table 3-31

Total acres of longleaf pine present relative to the acres proposed to remain unchanged, thinned, and cleared, incorporating appropriate training areas and corridors.

Alternative 1	Present	No Action	Thinned	% Thinned	Cleared	% Cleared
Total Acres	18,803	7,198	3,861	20.5	7,761	41.2
Not Classified	0	0	0	0	0	0
80 Year Old	48	12	36	75.0	0	0
70 Year Old	1,127	348	428	38.0	351	31.1
60 Year Old	8,674	2,897	1,701	19.6	4,076	47.0
50 Year Old	3,067	1,557	494	16.1	1,016	33.1
40 Year Old	481	198	127	26.4	156	32.4
30 Year Old	558	234	56	10.0	268	48.0
20 Year Old	687	333	62	9.0	292	42.5
0-10 Year Old	4,161	1,612	951	22.9	1,597	38.4

mortality due to accidental damage from vehicles, fire, root damage, etc. Therefore, the number of snags could recover or possibly exceed that occurring at present. Relative to the other alternatives, Alternative 1 will have the greatest potential negative impact on those species associated with snags.

The clearing of forest for corridors A, B, C, D, F, and G (see Figures 3-25 through 3-28) will likely restrict east-west movements by species not tolerant of open areas or frequent human disturbance. Extensive tracts of wetlands with associated buffer zones generally run northwest-southeast between PTAs 1 and 2 and between PTAs 2 and 3, impacting north-south movements between these areas to a lesser degree.

Overall, a decrease in biodiversity can be expected under this alternative. The decrease is attributed largely to the increase in permanent open area and edge that is expected to benefit edge and open area species at the expense of forest interior and area-sensitive species. In addition, the reduction of standing timber in a U.S. Forest Service district managed primarily for timber represents a substantial departure from the relatively contiguous stands of mature longleaf pine which existed during pre-settlement times. The turnback of 8,721 acres of former tracked vehicle areas may offset the impacts to interior species over the long-term, but only to the extent that suitable habitat is developed and maintained.

Alternative 2: Clearing forested areas under Alternative 2 will result in an estimated 179 percent increase in open area within proposed training areas and corridors from that at present. Alternative 1 is estimated to have a 156 percent increase in open area. With respect to edge creation, Alternatives 1 and 2 are considered equivalent (96% versus 92%). Potentially, there could be 14 forest fragments resulting from the clearing of timber for the corridors and within the PTAs, averaging 817 acres, with an overall edge to interior ratio of 1/114. Like Alternative 1, the four largest fragments average 2,603 acres each (interior to edge ratio of 1/214) and are located between PTAs 1 and 2 and PTAs 2 and 4, and are bordered on the east and west by their associated corridor sets. The edge/interior ratio of the largest fragments created by the formation of the corridors is slightly more favorable under this alternative than for Alternative 1, and more favorable still than 3A or 3B. Like Alternative 1, the small fragments occur within the PTAs and not between the parallel sets of corridors. Thus, when considering only the average edge to interior ratio of expected fragments, Alternative 2 is the least favorable among Alternatives 1-3B.

Table 3-32 shows that the same stand types occur in this alternative as for Alternative 1, and again the three most predominant stand types are longleaf, slash pine and sweetbay-swamp tupelo-red maple, which comprise 53 percent, 19 percent and 6 percent of the forested acres respectively. While these relative percentages mirror those for Alternative 1, there are fewer acres of each type under Alternative 2, and a few additional differences from Alternative 1. First, 15 percent less timber will be removed and is estimated that 15 percent fewer snags would be lost. Second, one of the existing stand types will be lost. One hundred percent of the white oak-black oak-yellow pine stand type will be cleared, as opposed to 75 percent under Alternative 1. Third, 56 percent of the longleaf is 60-80 years old (9,380 acres), of which 46 percent will be cleared (Table 3-33). This means that although Alternative 2 is about 4,000 acres smaller than Alternative 1, just 112 fewer acres of 60-80 year old longleaf will be cleared when compared with Alternative 1.

The gross acres included for Alternative 2 are less (about 4,000) than Alternative 1, but potential impacts from tracked vehicle activity are comparable. Alternative 2 contains 1464 fewer acres of land suitable for tracked vehicle traffic relative to Alternative 1. Again, this decrease is attributed largely to the increase in permanent open area and edge that is expected to benefit edge and open area species at the expense of interior and area-sensitive species.

Table 3-32

Total acres present within each stand type relative to the acres proposed to be thinned and cleared, incorporating appropriate training areas and corridors. The acres that remain after subtracting thinned and cleared acres from present acres will be left unchanged.

Alternative 2	Present	Thinned	% Thinned	Cleared	% Cleared
Total Acres	31,824	6,262	19.7	12,738	40.0
No Data	1	0	0	0	0
Loblolly Pine-Hardwood	498	19	3.8	124	24.9
Slash Pine-Hardwood	88	0	0	50	56.8
Longleaf Pine	16,854	4,006	23.8	6,564	39.9
Slash Pine	6,039	940	15.6	3,091	51.2
Loblolly Pine	1,406	381	27.0	568	40.4
Shortleaf Pine	300	4	1.3	256	85.3
Southern Red Oak-Yellow Pine	201	0	0	173	86.1
Bottomland Hardwood-Yellow Pine	1,093	96	8.8	309	28.3
Post Oak-Black Oak	29	0	0	0	0
White Oak-Black Oak-Yellow Pine	166	0	0	166	100.0
White Oak-Red Oak-Hickory	240	39	16.3	75	31.9
White Oak	63	1	1.6	0	0
Yellow Poplar-White Oak-Red Oak	58	51	87.9	7	12.1
Scrub Oak	10	10	100.0	0	0
Sweet Gum-Yellow Poplar	184	14	7.6	51	27.7
Sweet Gum-Nuttall Oak-Willow Oak	1,121	120	10.7	218	19.4
Willow Oak-Laurel Oak	289	41	14.2	35	12.1
Sweetbay-Swamp Tupelo-Red Maple	1,817	221	12.2	259	14.3
Undrained Flatwoods	27	0	0	10	37.0
Open / Firing Points	42	33	78.6	5	11.9
DOD	1295	284	21.9	778	60.1

Table 3-33

Total acres of longleaf pine present relative to the acres proposed to remain unchanged, thinned, and cleared, incorporating appropriate training areas and corridors.

Alternative 2	Present	No Action	Thinned	% Thinned	Cleared	% Cleared
Total Acres	16,850	6,284	4,006	23.8	6,564	38.9
Not Classified	0	0	0	0	0	0
80 Year Old	48	12	36	75.0	0	0
70 Year Old	1,107	328	428	38.7	351	31.7
60 Year Old	8,225	2,711	1,550	18.8	3,964	48.2
50 Year Old	2,996	1,389	682	22.8	925	30.9
40 Year Old	328	177	17	5.2	134	40.9
30 Year Old	878	216	514	58.5	148	16.9
20 Year Old	556	200	155	27.9	201	36.2
0-10 Year Old	2,712	1,250	625	23.0	837	30.9

Under Alternative 2, a net decrease in biodiversity can be expected, but to a slightly lesser degree than for Alternative 1. The reduction in standing timber in a USFS district with a management emphasis on timber production still represents a substantial negative departure from the relatively contiguous stands of mature longleaf pine which existed during pre-settlement times. Like Alternative 1, the turnback of 11,399 acres (approximately 3,000 more than in Alternative 1) of former tracked vehicle area could potentially offset the impacts to interior species to a degree, but again only to the extent that suitable interior habitat matures over time and is maintained.

Alternative 3A: This alternative contains less diverse stand types relative to Alternatives 1 and 2, and involves a much smaller area. Thirteen stand types are represented of which longleaf is the predominant type (40%), followed by loblolly pine (12%) and slash pine (8%) (Table 3-34). None of the forest types will be completely cleared, but slash pine-hardwood, southern red oak-yellow pine, and white oak-black oak-yellow pine will be reduced (76%-92% reductions). There will be an estimated loss of approximately 4,500 snags, 70% less than Alternative 1 and 65 percent fewer than Alternative 2. There are 1,171 acres of 60-70 year old longleaf (26% of the total longleaf acreage), of which 544 acres (46%) will be cleared. No managed stands of 80 year old longleaf will be affected under Alternative 3A (Table 3-35).

Table 3-34

Total acres present within each stand type relative to the acres proposed to be thinned and cleared, incorporating appropriate training areas and corridors. The acres that remain after subtracting thinned and cleared acres from present acres will be left unchanged.

Alternative 3A	Present	Thinned	% Thinned	Cleared	% Cleared
Total Acres	11,601	2,724	23.5	4,517	38.9
No Data	1	0	0	0	0
Loblolly Pine-Hardwood	306	21	6.9	109	35.6
Slash Pine-Hardwood	12	0	0	11	91.7
Longleaf Pine	4,586	1,420	31.0	1,591	34.7
Slash Pine	983	294	29.9	270	27.5
Loblolly Pine	1,424	290	20.4	661	46.4
Shortleaf Pine	476	76	16.0	192	40.3
Southern Red Oak-Yellow Pine	162	22	13.6	140	86.4
Bottomland Hardwood-Yellow Pine	896	202	22.5	366	40.8
Post Oak-Black Oak	0	0	0	0	0
White Oak-Black Oak-Yellow Pine	379	91	24.0	288	76.0
White Oak-Red Oak-Hickory	38	0	0	16	42.1
White Oak	0	0	0	0	0
Yellow Poplar-White Oak-Red Oak	0	0	0	0	0
Scrub Oak	0	0	0	0	0
Sweet Gum-Yellow Poplar	84	0	0	0	0
Sweet Gum-Nuttall Oak-Willow Oak	0	0	0	0	0
Willow Oak-Laurel Oak	0	0	0	0	0
Sweetbay-Swamp Tupelo-Red Maple	911	94	10.3	245	26.9
Undrained Flatwoods	0	0	0	0	0
Open / Firing Points	87	32	36.8	46	52.9
DOD	1256	182	14.5	582	46.3

Table 3-35

Total acres of longleaf pine present relative to the acres proposed to remain unchanged, thinned, and cleared, incorporating appropriate training areas and corridors.

Alternative 3A	Present	No Action	Thinned	% Thinned	Cleared	% Cleared
Total Acres	4,575	1,575	1,420	31.0	1,591	34.7
70 Year Old	84	22	12	14.3	50	59.5
60 Year Old	1,087	415	178	16.4	494	45.4
50 Year Old	525	250	229	43.6	46	8.8
40 Year Old	153	21	111	72.5	21	13.7
30 Year Old	922	316	464	50.3	142	15.4
20 Year Old	263	134	93	35.4	36	13.7
0-10 Year Old	1,541	411	328	21.3	802	52.0

Alternative 3A will result in an estimated 72 percent increase in open area (Table 3-28) and a 67 percent increase in edge within the proposed training areas and corridors (Table 3-29) from that at present. Potentially, at least three forest fragments will be created from the clearing of timber for the corridors and within the PTAs and these fragments will average 913 acres. More importantly, however, the edge to interior ratio of the fragments is estimated tobe 1/125. Considering only Alternatives 1-3B, this is the least favorable edge/interior ratio, but this alternative also would involve the least forest fragmentation.

Alternative 3B: Longleaf pine is also the predominant stand type affected (45%) under this alternative, followed by loblolly pine (12%), sweetbay-swamp tupelo-red maple (9%) and slash pine (9%) (Table 3-36). Collectively, these four types comprise nearly 75 percent of the forested areas represented under Alternative 3B. Considering only the longleaf pine, 10 percent is 60 years or older and after the proposed clearing should still constitute 9 percent of the total. Alternative 3B contains the same acreage of 80 year old longleaf as Alternatives 1 and 2, and about half the acreage of 60-70 year old longleaf as Alternatives 1 and 2 (compare Tables 3-31, 3-33 and 3-37). The drop of 7 percent of the 60 year old or older longleaf is half of the proposed decrease of Alternative 3A and one third of the proposed decrease of Alternatives 1 and 2.

Alternative 3B will result in an estimated 42 percent increase in open area (Table 3-28) and a 74 percent increase in edge (Table 3-29) within the proposed training areas and corridors from that at present. Alternatives 3A, 1, and 2 are progressively more severe in terms of open area. Approximately 5,273 snags will be lost initially, 17 percent more than the snag loss estimated for Alternative 3A. Potentially, seven forest fragments will remain, located between the nine corridors created and within the PTAs, and will average 1,059 acres. The

Table 3-36

Total acres present within each stand type relative to the acres proposed to be thinned and cleared, incorporating appropriate training areas and corridors. The acres that remain after subtracting thinned and cleared acres from present acres will be left unchanged.

Alternative 3B	Present	Thinned	% Thinned	Cleared	% Cleared
Total Acres	21,883	5,995	27.4	5,273	24.1
No Data	1	0	0	0	0
Loblolly Pine-Hardwood	333	21	6.3	109	32.7
Slash Pine-Hardwood	78	0	0	11	14.1
Longleaf Pine	9,823	3,786	38.5	1,844	18.8
Slash Pine	1,902	625	32.9	348	18.3
Loblolly Pine	2,521	584	23.2	976	38.7
Shortleaf Pine	476	76	16.0	192	40.3
Southern Red Oak-Yellow Pine	162	22	13.6	140	86.4
Bottomland Hardwood-Yellow Pine	1,055	202	19.1	369	35.0
Post Oak-Black Oak	0	0	0	0	0
White Oak-Black Oak-Yellow Pine	516	91	17.6	288	55.8
White Oak-Red Oak-Hickory	38	0	0	16	42.1
White Oak	0	0	0	0	0
Yellow Poplar-White Oak-Red Oak	0	0	0	0	0
Scrub Oak	0	0	0	0	0
Sweet Gum-Yellow Poplar	107	9	8.4	0	0
Sweet Gum-Nuttall Oak-Willow Oak	75	0	0	14	18.7
Willow Oak-Laurel Oak	0	0	0	0	0
Sweetbay-Swamp Tupelo-Red Maple	1,916	232	12.1	278	14.5
Undrained Flatwoods	0	0	0	0	0
Open / Firing Points	378	80	21.2	46	12.2
DOD	2503	268	10.7	641	25.6

edge to interior ratio of the fragments is estimated to be 1/150. While this ratio is more favorable relative to Alternative 3A, twice as many fragments would be created in Alternative 3B due to the additional PTAs and twice the number of corridors (a more circular configuration overall) constructed.

Table 3-37

Total acres of longleaf pine present relative to the acres proposed to remain unchanged, thinned, and cleared, incorporating appropriate training areas and corridors.

Alternative 3B	Present	No Action	Thinned	% Thinned	Cleared	% Cleared
Total Acres	9,807	4,193	3,786	38.5	1,844	18.8
No Data	0	0	0	0	0	0
80 Year Old	47	47	0	0	0	0
70 Year Old	889	572	228	25.6	89	10.0
60 Year Old	3,860	1,626	1,639	42.5	595	15.4
50 Year Old	1,373	614	640	46.6	119	8.7
40 Year Old	402	135	207	51.5	60	14.9
30 Year Old	1,217	495	579	47.6	143	11.8
20 Year Old	412	283	93	22.6	36	8.7
0-10 Year Old	1607	411	394	25.6	802	49.9

Alternative 4: This alternative is largely a continuation of present activities, and unlike Alternatives 1-3B, timber clearing is not proposed, although maintenance of previously cleared and thinned areas will require some timber removal. For a discussion on impacts to biodiversity from present activities, please refer to Section 3.1.2.6. An additional impact from the present is that four of the six proposed facilities will be constructed, and some minor impacts on the local vegetation and wildlife are anticipated. The two facilities with the greatest potential negative impacts, the multiple purpose range complex-heavy (MPRC-H) and the Tactical Aviation areas, will not be constructed under this alternative. Overall, the amount of open area (Table 3-28) and edge (Table 3-29) should remain comparable to current conditions, and little change in biodiversity is expected. The total acres present within the different stand types are listed in Table 3-38 and the total acres of longleaf pine for the different age-classes is located in Table 3-39.

Table 3-38

Total acres present within each stand type with regards to Alternative 4.

Alternative 4	Present
Total Acres	16,537
No Data	5
Loblolly Pine-Hardwood	27
Slash Pine-Hardwood	104
Longleaf Pine	7,839
Slash Pine	4,117
Loblolly Pine	1,208
Shortleaf Pine	12
Southern Red Oak-Yellow Pine	43
Bottomland Hardwood-Yellow Pine	723
Shortleaf Pine-Oak	0
White Oak-Black Oak-Yellow Pine	289
White Oak-Red Oak-Hickory	54
Yellow Poplar-White Oak-Red Oak	0
Sweet Gum-Yellow Poplar	56
Sweet Gum-Nuttall Oak-Willow Oak	8
Willow Oak-Laurel Oak	3
Sweetbay-Swamp Tupelo-Red Maple	1,469
Undrained Flatwoods	0
Open / Firing Points	575
DOD	5

Table 3-39

Total acres of longleaf pine present with respect to the different age-classes.

Alternative 4	Present
Total Acres	7,824
Not Classified	0
80 Year Old	79
70 Year Old	1,574
60 Year Old	1,783
50 Year Old	612
40 Year Old	105
30 Year Old	1,051
20 Year Old	645
0-10 Year Old	1,975

Alternative 5: Fewer negative impacts to biodiversity are expected under this alternative since off-road tracked vehicle activities will cease, and the former T-areas will be incorporated back into the USFS management base and managed similarly to the other units in the district. Thus, biodiversity would mirror that of the general forest areas on approximately 52 percent of the longleaf pine in the current T-areas, of which 30-50 percent is 60 years or older (Appendix O). This percentage of older pine in the T-areas is similar to the range reported for longleaf stands under Alternatives 1 through 3B.

Tracked vehicle activity has resulted in early successional vegetation stages. Thus, an increase in the understory vegetation, quantity, species composition, and structure (variability and height), is expected after tracked vehicles are removed. Similarly, increases in bird and small mammal abundance are expected in response to the increase in vegetative abundance and diversity. Any increase in cover, foraging and nesting sites, should benefit wildlife, especially those species utilizing open pine or edge habitats. Interior associated species should increase their use of these areas as the existing stands age and ecological succession proceeds. As part of the normal USFS even-age management base, however, portions of the former T-areas could be regenerated. As each stand within the former T-areas is cut, interior species would again immediately reduce their use of the area followed by increased use of

edge and open area species. However, if age classes are balanced (a USFS management goal) additional areas of older timber would be available for use.

The lack of tracked vehicle activity should eventually improve the vegetative conditions to that found in non-tracked vehicle areas of similar topography and soil characteristics. While the habitat improvements will benefit numerous wildlife species, a management emphasis will still be placed on sustainable timber production (in addition to threatened, endangered and sensitive or TE&S species recovery and protection where applicable).

Unless longleaf stand sizes are increased, linked together, and allowed to achieve old growth conditions, a significant increase in biodiversity is not expected. Rehabilitating the former T-areas will increase the available habitat and benefit the majority of the wildlife species, but the lack of tracked vehicle activities will not restore pre-settlement conditions. However, biodiversity is not expected to increase at the permit area and regional level under the current Land and Resource Management Plan (LRMP) for the National Forests in Mississippi.

This alternative would allow the U.S. Forest Service to retain other options for the management of the returned tank training areas. The LRMP for the National Forests in Mississippi is being amended. This process is expected to take 2-3 years. Recent U.S. Forest Service direction is to begin implementing ecosystem management with reduced emphasis on clear-cutting and even-age management. Therefore, it is reasonable to expect alternatives in this amendment to feature longer rotations, uneven-age management, large areas of timber land removed from the management base, and other biodiversity favoring strategies. Thus, under Alternative 5, the returned tank acreage would be available for various management strategies in the up-coming amendment.

Alternative 6: Little increase in biodiversity is expected under this alternative in spite of the anticipated reduction in off-road wheeled vehicle activities and the cessation of military activities. In keeping with the spirit of the Camp Shelby biodiversity committee (Chapter 6) discussions, optimum biodiversity would be achieved if Camp Shelby contained functional assemblages of flora and fauna that existed in pre-settlement times. Thus, a significant increase in biodiversity (assuming current and proposed TE&S mitigation measures are followed) relative to the present could only be achieved with the establishment and maintenance of large, contiguous stands of mature (>120 years) longleaf pine. Alternative 6 entails only rehabilitation and conservation of present ecological communities, with no provision for allowing some stands to achieve old-growth conditions. In the absence of the military, the USFS would continue to manage the permit area for multiple use.

It is possible to achieve high levels of biodiversity in managed forests by leaving stands in a variety of ecological stages. More often than not, however, the evidence suggests that biodiversity is more likely to be highest in mature, unmanaged forests as the structural complexity takes many years to develop (longer than most rotation periods). Therefore, while Alternative 6 would have the fewest environmental impacts to the existing ecological communities, it may not result in large expanses of older growth longleaf forest representative of pre-settlement times.

As in Alternative 5, this alternative would also allow the U.S. Forest Service to retain other options for management. All acreage currently being used for military purposes except the high explosive impact area would be included in the management strategies in all alternatives considered in the up-coming amendment.

3.3.3 Quality of Life

This section will examine the potential effects of proposed alternatives on the quality of life of residents adjacent to the Special Use Permit (SUP) area boundary. As described in Section 1.2, there are six basic alternatives proposed for the continued and reconfigured military training use of De Soto National Forest lands. The development and use of the proposed new tracked vehicle maneuver areas has the potential to cause increased generation of fugitive dust. This dust may be carried to residences which are in closest proximity to the maneuver areas. Those residences near newly used training areas and corridors may expect to experience more frequent incidence of dust annoyance, while those adjacent to present training areas may experience some decrease. The extent and severity of this dust will be related to soil conditions and the wind speed and direction, and cannot be quantified or related in any clear manner to a particular alternative.

Alternative 1 meets task force training requirements through battalion level. It facilitates the encampment of a brigade size unit at Camp Shelby. Proposed training areas (PTAs) 1, 2, 3 and Corridors A, B, C, D, F and G are used under this alternative. Residents and users of these areas will be impacted. Figure 3-50 shows the training areas and corridors for this alternative with respect to sensitive land uses. Sensitive land uses are comprised of residences, church buildings, camp sites and schools. Due to proposed training in PTA 3, quality of life of residents in the towns of New Augusta and Beaumont and along Highway 98 (north and northeast of the SUP boundary) will be affected. There are two church buildings located along Highway 98.

Alternative 2 facilitates military training with provision for new company team maneuver area. PTAs 1, 2, 4 and Corridors A, B, C, D, E are used under this alternative. With PTA 4, more training activities will take place near Highway 29. There are several residences and one church along Highway 29 south of PTA 4 (Figure 3-51) inside the SUP boundary that would potentially be affected.

Alternative 3 proposes continuation of military training with tracked vehicle maneuver limited to northwest section. This alternative was divided into two sub-options. Alternative 3A uses PTAs 3, 4, 5 and corridors D, E, F, H (Figure 3-52). PTA 5 would mainly be used to assemble and move to PTAs 3 and 4 for maneuver. This alternative involves movement west of Highway 29. Quality of life (QOL) of residents along Highway 98 north of PTA 5 would potentially be affected. There are also two church buildings located near the intersection of Highways 29 and 98. The QOL of people living near the southern part will be improved since PTAs 1 and 2 will not be used. Alternative 3B uses PTAs 3, 4, 5, 6 and corridors D, E, F, H, K, L, M. South portion of PTA 6 is close to Paret Tower and a few residences near

the tower. With this alternative, there are also additional corridors (K, L, M) west of Highway 29 (Figure 3-53).

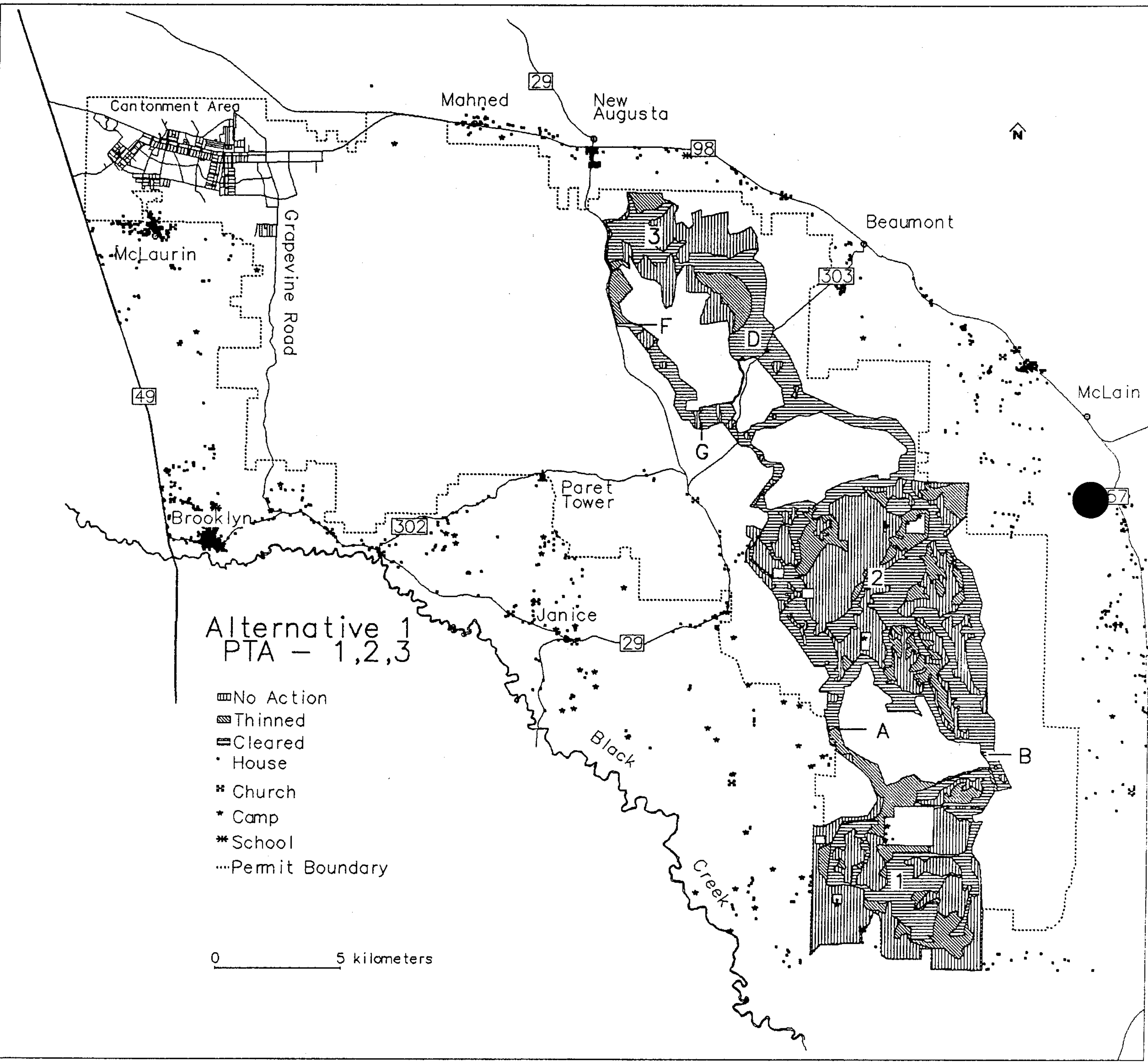

Figure 3-50 Sensitive Land Uses in Relationship to Alternative 1

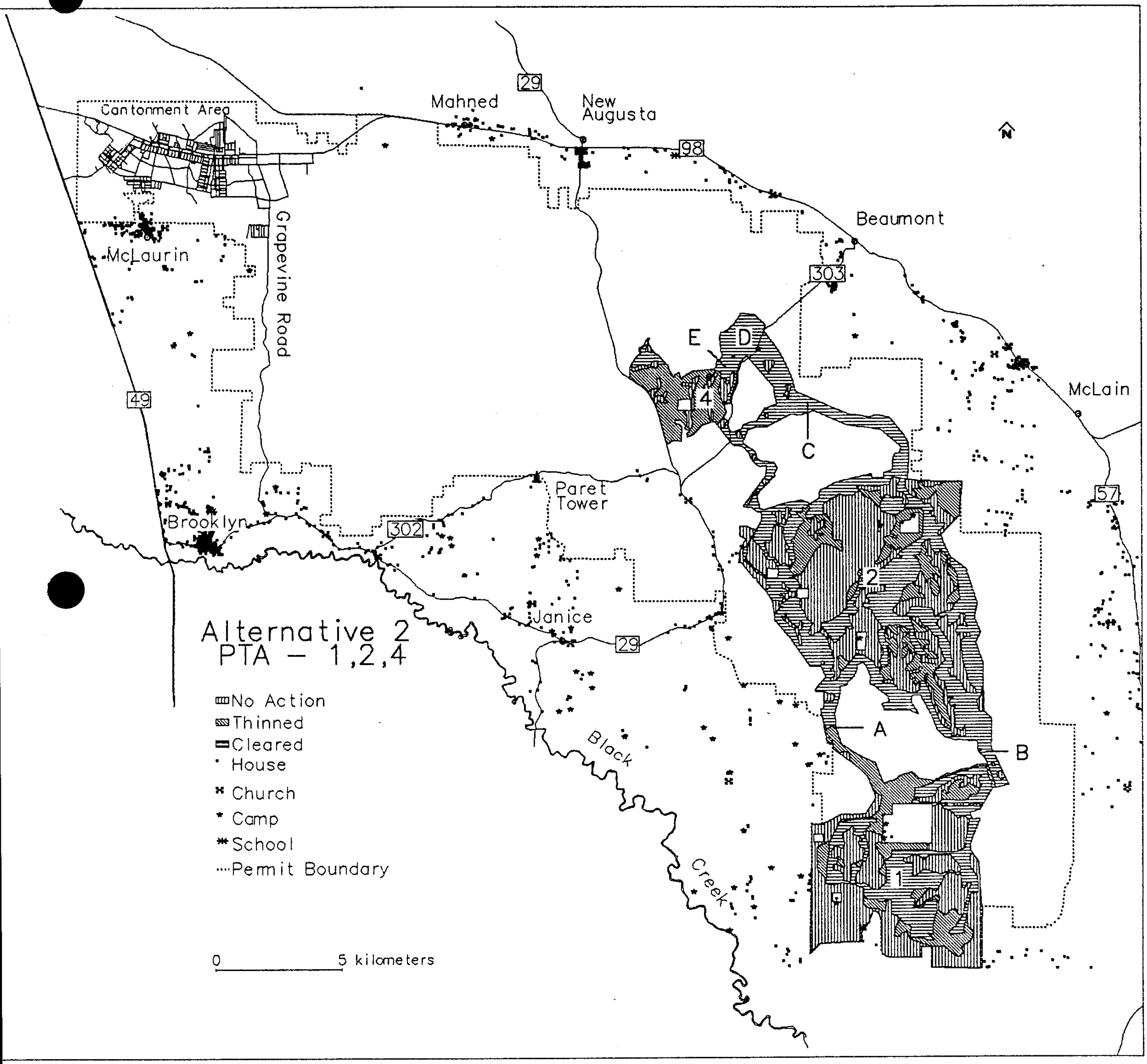

Figure 3-51 Sensitive Land Uses in Relationship to Alternative 2

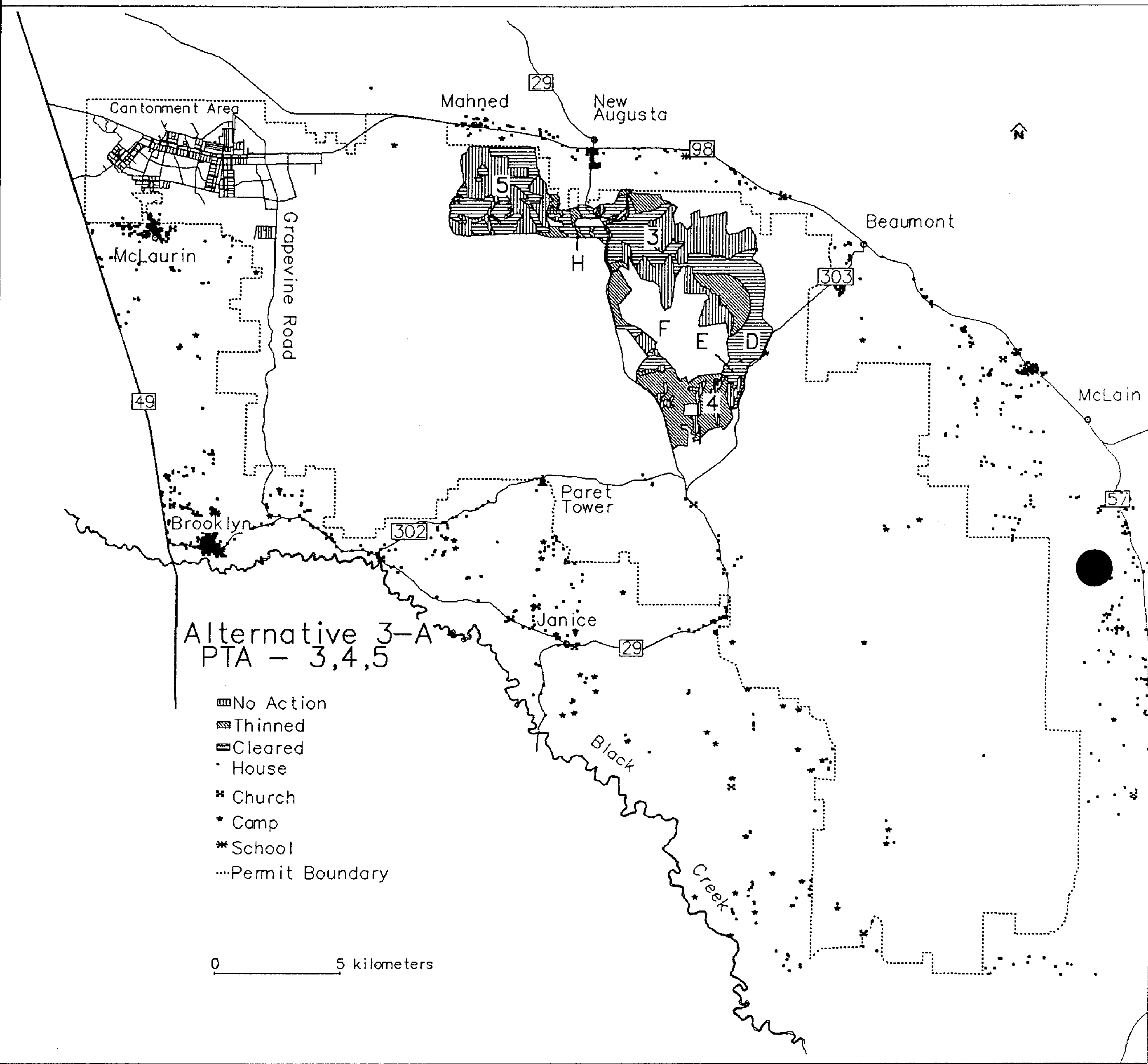

Figure 3-52 Sensitive Land Uses in Relationship to Alternative 3A

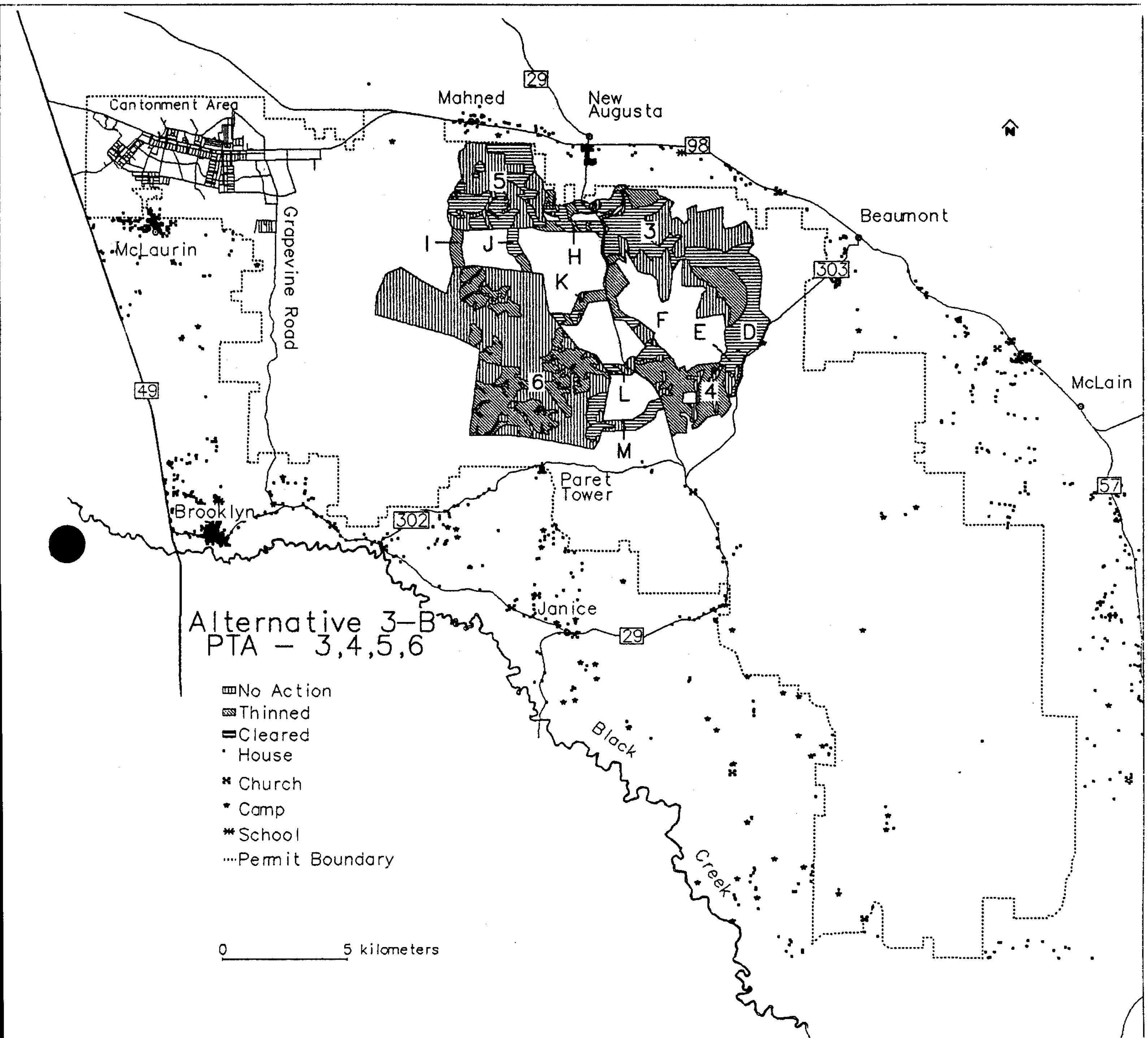

Figure 3-53 Sensitive Land Uses in Relationship to Alternative 3B

With Alternative 4, all current military training would be maintained. No new tracked vehicle maneuver areas are proposed. Therefore, there would be no change in potential affects on the QOL of residents than status quo. Alternative 5 proposes to continue range and firing activities without off-road tank maneuver. With this option, current training activities would be modified to exclude off-road tracked vehicle maneuvers. Alternative 6 (No Action) proposes to discontinue all military training at Camp Shelby. National Forest land now under the SUP will return to multiple use management by the Forest Service. Therefore, there would be no potential effects on the QOL of people living adjacent to the SUP area boundary due to military training activities. However, depending on the nature and extent of use of the land by the Forest Service, there may be potential for effects on QOL from the Forest Service activities.

3.3.3.1 Governmental Entities

No actions are proposed which are expected to result in boundary changes or other changes in units of local government.

3.3.3.2 Employment Profile

No change in the employment profile is anticipated except from closure of Camp Shelby (Alternative 6). Employment and unemployment rates, as well as average incomes are all anticipated to remain stable should Alternatives 1, 2, 3A, 3B, or 4 be implemented. Some reduction in employment at the installation is likely under Alternative 5, but the number of jobs lost has not been specifically determined. Employees at Camp Shelby are Active Guard/Reserve (AGR), federal technicians, and State of Mississippi. With closure of Camp Shelby approximately 700 employees have the potential to lose employment.

3.3.3.3 Historic and Cultural Setting

As presented in Sections 2.5.3.1 and 3.1.3.3, widespread survey of Camp Shelby and the De Soto National Forest has identified two historic structures and only scattered, highly disturbed, fragmentary evidence of prior settlement by Native Americans. The Mississippi State Historic Preservation Officer has stated that extensive, wide area surveys of the potentially affected areas under all action alternatives could not expect to result in location of any sites eligible for listing on the National Register. Thus, none of the proposed maneuver area development could be projected to have major impacts on archeological sites. To satisfy U.S. Forest Service permit requirements, prior to any new site-disturbing construction or activity on National Forest lands at Camp Shelby by the Army National Guard, an archeological survey will be conducted. See Section 3.4.7 and Appendix A, Part 2, Clause 47.

3.3.3.4 Recreation Availability

The effects on the recreational use of the De Soto National Forest resulting from military use were assessed using the outcome of the Camp Shelby Recreational Use Survey (Appendix F). The proposed alternatives vary in their potential for effects on recreation use. Contact

between civilians and the military, public access to areas used by the military, and the potential for effects on hunting have been reviewed (Table 3-40).

Military-Civilian Contact: The survey reported few instances of encounters between training troops and recreational users. With approximately 80 training days per year anticipated, there may be an increased chance of military-civilian contact. Maneuver corridor sets, included in Alternatives 1, 2, 3A, and 3B may also increase the potential for military-civilian interaction, but the degree to which this could occur is not easily determined. Alternative 1 proposes to incorporate areas within the Black Creek Ranger District (BCRD) that account for approximately 59 percent of the total hunting, camping and canoeing reported. In Alternative 2, proposed training area (PTA) 4 and Corridor D are only small segments of Zone 2 (the area east of Highway 29 and north of the Leaf River Wildlife Management Area), indicating an only slightly increased chance of military-civilian interaction. Alternatives 3A and 3B would be implemented along both sides of Highway 29 with the accompanying potential for military-civilian encounters at the highway.

Public Access: Alternatives 1 and 2 should provide more non-forested lands and many more access roads than are presently available. These would be available for possible use by hunters and others. Alternatives 3A and 3B would provide somewhat less additional benefit because they incorporate currently extensive cleared areas. Exercises involving 3A or 3B would also require intermittent closure of Mississippi Highway 29 many times per day when major exercises are taking place. Camp Shelby regulations limit this closure to 15 minutes at a time, although this may be repeated 6 to 10 times in a busy day. This is a potential problem for general public access for all purposes, including recreational use. Alternative 3A would include the use of PTA 5, located between current training areas and the installation boundary, and would most likely not affect the recreational use of Camp Shelby and the BCRD. Alternative 3B proposes the use of PTAs which either overlap or are adjacent to current training areas.

The Rattlesnake Bay all terrain vehicle (ATV) trail lies within PTA 3, in the northern portion of the permit area. The opportunity for developing other hiking, horseback, and ATV trails will be restricted within PTAs and corridors. Alternatives 3A and 3B, however, would restrict off-road maneuvers to the northwest half of Camp Shelby. Implementation of these alternatives would severely limit any siting of recreational use trails in that location. The additional open area and tank trails will provide a favorable setting for users of motorcycles and other ATV's, however. Thus Alternatives 1 and 2 would provide the greatest opportunities for these activities. Use, however, would be restricted during the summer Annual Training (AT) period by maneuver activity. None of the other alternatives would affect this proposal. A local equestrian group proposed a horseback trail in the LRWMA.

Table 3-40
Conceptual Schedule for Hunting Season, Vegetative Rehabilitation, Military Training

Date	Hunting Season	Leaf River Wildlife Management Area		All Areas Except LRWMA	
		Vegetative Rehab. Work	Training Schedule	Rehab/Growth Period	Training Type
JAN 1	deer small game	rest, winter growth	no training, full public access	rest/winter growth	no training
10					
20	small game	none-weekend training	all types of military training	none-weekend training	all types of military training
FEB 1					
10					
20					
MAR 1					
10					
20	turkey	plant rehab-weekend training	all military training except track maneuver		
APR 1					
10					
20					
MAY 1		none-annual training	all types of military training	none-annual training	
10					
20					
JUN 1					
10					
20					
JUL 1					
10					
20					
AUG 1					
10					
20					
SEP 1		none-weekend training		rehab/weekend training	* all types of military training
10					
20					
OCT 1	deer				
10		rehab/soil regeneration	all military training except track maneuver		
20					
NOV 1		rest, grasses mature	no training, full public access		
10					
20				rest	no training
DEC 1				none-weekend training	**all types of military training
10					
20				rest	no training

* Areas scheduled to avoid rehab work
** Planted areas to be avoided

Alternatives 1 and 2 would preclude this use since maneuver corridors follow ridges and established roads and would be utilized throughout the summer. None of the other alternatives would affect this proposal.

Driving for pleasure would be most seriously impacted by Alternatives 1 and 2. These alternatives would use most of the roadsides east of Highway 29 for corridors or training areas. The character of the area would change from a timbered environment interspersed with openings to a large opening interspersed with wildlife corridors, timbered drainages and lower slopes. Alternatives 3A and 3B would have a lesser effect because the affected areas are west of Highway 29. The areas in these alternatives which are east of the highway are either already cleared or are inaccessible. Alternatives 4 and 5 would show no change from the present. Alternative 6 would open the area west of Highway 29 to unrestricted use except for the impact area, which will remain a safety hazard.

Hunting: Under Alternatives 1 and 2, slightly more open land and many more access roads would be established. These would be available for possible use by hunters and others. With Alternatives 3A and 3B, hunters may realize a minor negative effect because fewer trails and openings will be maintained in the remainder of Camp Shelby. Alternative 4 would maintain the status quo. In Alternative 5, the benefits of training area management would be diminished. Rehabilitation of tracked vehicle maneuver areas includes construction of erosion control structures as well as planting vegetation. This vegetation not only stabilizes the soil but also provides food for wildlife. This alternative could result in a decreased number of individuals within species which previously benefitted from the plantings. Thus, the impact to hunters would depend on which species is being sought, and what stage in the regeneration cycle is present. Closure would be a short-term gain and a long-term loss to hunters, as some habitat diversity would possibly be lost. See also Section 3.5.7.

The development of Tactical Aviation Areas (TAAs), which would maintain 30 to 80 acre clearings, is expected to be beneficial to many wildlife species and may be attractive hunting areas. Aviation units are currently allowed to use cleared areas within the boundary for staging so noise may occur anywhere on the installation. Establishing designated assembly areas should serve to minimize noise-related problems on the remainder of Camp Shelby. The TAA openings, and other openings created by development of the proposed tracked vehicle maneuver areas will enhance access to persons who must be airlifted from the site to medical facilities in Hattiesburg by either military or civilian MEDEVAC helicopters.

Direct effects on the recreational value of the BCRD resulting from any of the alternatives are difficult to estimate because of the wide range of activities that occur within the BCRD. In addition, opinions vary among individuals as to what level of disturbance is enough to detract significantly from their enjoyment of the BCRD. For example, people desiring a true wilderness experience may be disturbed by the clearing and thinning while those for whom long-distance sightings of large animals are most desired may find the clearing and thinning beneficial. Adoption of any one of the alternatives will have both positive and negative effects on recreational use. The degree of change in the proposed alternatives is not expected to preclude recreation seekers from enjoying the BCRD.

3.3.4 Economic Environment

3.3.4.1 Regional Economy

Full-time employees of Camp Shelby utilize the goods and services available locally. Local suppliers benefit from the operational requirements of the installation as well as from the personal needs of the employees. The No Action alternative (Alternative 6) will have adverse impacts to the regional economy. Under this option, all military training and other functions at Camp Shelby would be stopped.

Other alternatives or combinations thereof are believed to involve retention of the existing workforce. There is also some possible increase in personnel required to maintain training areas as well as need for a few additional training personnel. These options will bring additional business to the local area during the training months and will have a small, but unquantifiable positive affect on the regional economy.

The preferred alternative (Alternative 1) requires improvements in existing Camp Shelby facilities as well as development of two battalion task force maneuver areas for training. It would be possible under this option to bring an entire brigade to the training sessions. Thus, this alternative will have a positive economic impact on the Camp Shelby region during training periods when additional business is brought into the area by an increase in temporary workforce. The increase in the Camp Shelby temporary workforce also supports a variety of local retail establishments and roadside businesses (e.g., gas stations, restaurants, and small convenience stores) which also benefit the local economy to some extent.

3.3.4.2 Mineral Exploration and Extraction

Leasing of National Forest land for mineral exploration and extraction is not controlled by the National Guard, except to the extent that dedicated impact areas may not, in practical terms, be available for occupancy or surface use. Directional drilling may be employed to explore for or recover mineral resources in these areas. Implementation of the different alternatives would affect different amounts of acres under mineral rights leases. Table 3-41a shows the numbers of leased acres affected, by alternative.

Table 3-41a
Mineral Rights Leased Acres Coincident with Proposed Training Areas and Corridors
(National Forest Lands Only)

Alternative	1	2	3A	3B	4
Acres	35,654	31,711	11,571	21,853	12,231

Existing active wells only occur in one proposed area, Corridor F. Corridor F will be used with the establishment of Alternatives 1, 3A, or 3B. Should one of these alternatives be implemented, individual site engineering determinations will be made to protect the well sites and equipment. Military Use Special Stipulations for leases under Interior Department control for the Camp Shelby Training Area will continue to be incorporated in the standard leases under any of the alternatives. See Appendix T for a standard lease and the Camp Shelby-specific Military Use Stipulations.

Several thousand acres within the Camp Shelby permit area are underlain by privately held mineral rights. Table 3-41b, "Privately Held Mineral Rights", shows for each alternative, a breakdown of the number of such acres thinned, cleared or where no action has been taken. At this time, no exploration or extraction activity is occurring on these tracts, but development of these rights may be impacted by development of training areas and corridors, similar to the effects on mineral rights availability where the rights are held by the U.S. Government.

Table 3-41b
Privately Held Mineral Rights Coincident with Proposed Training Areas and Corridors

Alternative	1	2	3A	3B	4
No action (acres)	99.1	52.2	74.7	635.4	3428.4
Thinned (acres)	2.3	186.0	188.2	343.5	316.8
Cleared (acres)	120.9	68.9	46.6	67.0	30.5

The natural gas pipeline operated by Florida Gas Transmission crosses the northern edge of PTA 1. There is some hazard involved in unrestricted operation of heavy vehicles above the pipeline route, where repeated soil displacement could increase stress on the wall of the pipe, leading to an eventual leak or blowout. Proposed mitigations to preclude this hazard are presented in Section 3.4.12.

3.3.4.3 Forest Industry

A stable, managed timber land base is essential to maintaining viable forest product industries. There are no significant longer term (40 years) negative effects compared to the current managed land base from implementing any of the alternatives.

Except for Alternative 4, all Alternatives will result in additional timber removal, to varying degrees, in the first period. Alternatives 1-3B will have about 2 million board feet (MMBF) and Alternative 5 about 3 MMBF coming off the currently authorized tank areas which would be returned to normal forest management. Alternative 6, no permit issued and all lands except the main impact area returned to forest management, would result in additional annual volumes of about 4 MMBF during the first period.

By spreading any implementation volume over several years (Section 3.3.2.3) and deferring part of the regular timber sale program to maintain relatively stable supplies (FY 1991 levels), there should be little short term impact to wood using industries. The slight increases in volume will, however, benefit the local logging contractors. These volumes are more significant to the logger whose annual production runs 8-20 MBF. Thus, they would be the beneficiary of more close work with shorter hauls.

The longer term effects are more significant, vary with the alternative, and continue to increase over time until the long term sustained yield is reached for the returned tank areas (see Table 3-26). Over forty years the annual increase over current management is less than 1 MMBF for Alternatives 1 and 2, about 1 MMBF for Alternative 3B, and 2, 4, and 6 MMBF for Alternatives 3A, 5, and 6 respectively. The volumes for Alternative 5 and 6 would continue to increase for another thirty years as currently cleared and subsequently planted tank areas enter the period of peak sawtimber growth. Conversely, the volume increase for Alternatives 1 and 2 would disappear and become slightly negative in periods 3 and 4 due to the effects of the lost production from the new tank areas (see Table 3-26, part B).

The effects on employment from increased volumes coming on the market are negligible for all alternatives, both long and short term. It's estimated that somewhere between 14 and 20 woods jobs are created for every 10 MMBF of National Forest timber sold. Thus, in the short term, about 3-4 jobs would be created regardless of the alternative selected; in the long term no job growth for Alternatives 1 and 2 would occur. The other alternatives range from 3-10 additional jobs which would be created.

The availability of longleaf poletimber to the pole treating industry should remain relatively stable both long and short term. Although there will be a net change from currently managed longleaf acreage, Table 3-42, the negative change for Alternatives 1 and 2 is not as significant as it may appear. Any volume loss would not appear until the third and fourth periods (Table 3-26). By then it should be off-set by the increasing volumes of longleaf resulting from previously harvested stands entering full production. Much of this would come from longleaf stands which had originally been other pine species.

3.3.4.3.1 County Returns

The effects of implementing any of the action alternatives (Alternatives 1-3B) would be negligible over the short term (10 years) because timber sales for the De Soto National Forest would be maintained at essentially FY 1991 levels. Comparable regular program volume would be deferred to later years. An examination of Tables 3-25 and 3-26 shows no negative long-term (40 years) effect from implementing any alternative when compared to current management.

Table 3-42 - Change in Managed Longleaf Pine Acreage

Type Action	Net Acres by Alternative						
	1	2	3A	3B	4	5	6
As Proposed	11,679	10,600	3,089	5,755	8,300	0	0
Turned Back	4,497	6,018	4,126	1,957	0	8,300	17,098
New Areas	10,013	9,762	1,369	3,356	0	0	0
Net Change	-5,516	-3,744	+2,757	-2399	0	+8,300	+17,098
	Gross Acres by Alternative						
As Proposed	18,881	16,886	4,673	10,198	8,405	0	0
Turned Back	4,564	6,080	4,220	2,038	0	8,300	17,098
New Areas	16,314	15,872	1,973	6,180	0	0	0
Gross Change	-11,750	-9,792	+2,247	-4,142	0	+8,300	+17,098

*Pro-rated from current (ALT 4)

Implementation of any of the alternatives may be expected to increase contributions to the county return pool by about $100,000 annually during the first ten year period. This is due to current tank maneuver areas coming under normal management. Following the first period and for the 40-year period, only Alternatives 3A, 5, and 6 show an appreciable increase over what may be expected under current management. Alternatives 1 and 2 would show some decreases in the fourth period as the deferred volume is no longer available.

It should be noted that any changes would be divided among the 10 counties sharing these receipts (see Section 2.6.3.1).

3.3.5 Noise

In the broadest sense, no significant changes are proposed which would result in changes in the training-related noise generated by military activity at Camp Shelby. Certain proposed actions could, however, cause some shifts in the areas where this noise is generated, and, thus, which persons in the adjacent population might be exposed to this noise.

3.3.5.1 Impulse (Weapons) Noise

The only potentially significant proposed action which would change the impulse noise profile of Camp Shelby is associated with the fielding and training use of the M1A1 Abrams main battle tank, which is equipped with a 120mm main gun (see Section 1.2.1.4.9). A revised impulse noise contour was developed (Figure 3-54A) which compares the areas contained

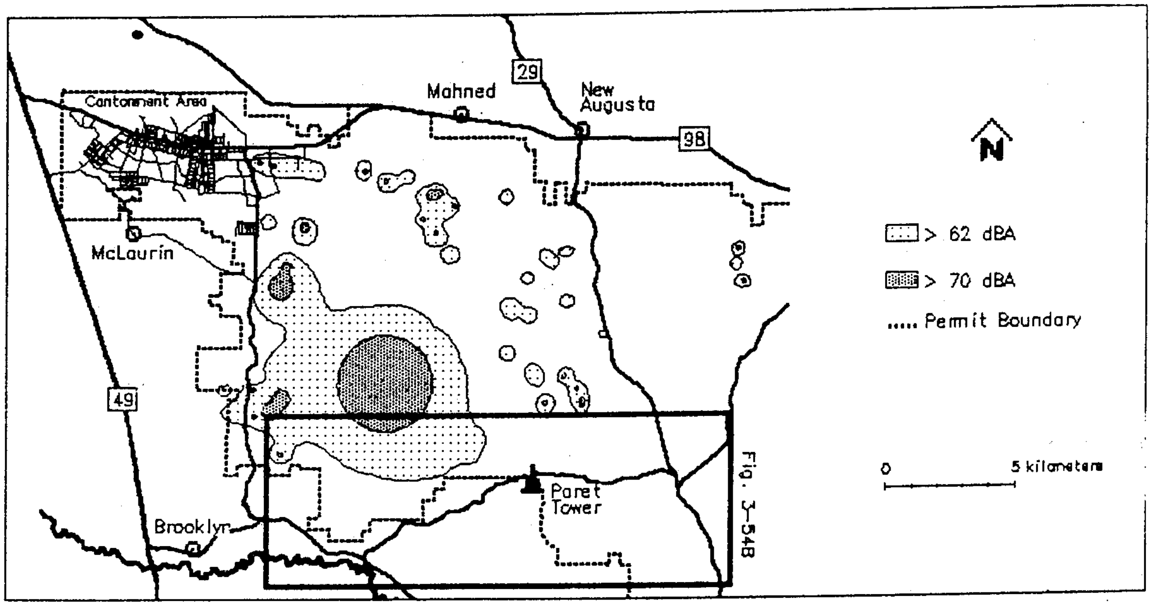

Figure 3-54A Tank Main Gun Noise Contours - 120mm vs 105mm

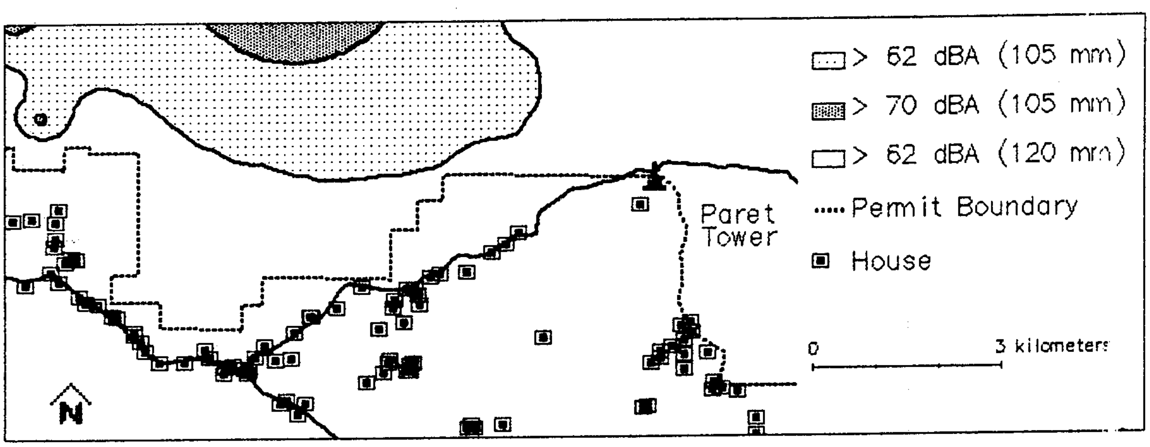

Figure 3-54B Residences Nearest to Zone II Noise Contours

within Zone II for both weapons. Geographic information analysis compared the number of residences near or within Zone II when 120mm main gun use is compared to use of the 105mm main gun. This analysis showed that no residences are located within Zone II in either case, although the 16 which were closest to the firing points may experience somewhat more noise than when only the 105mm gun is used (Figure 3-54B). No churches or schools are within Zone II for either case.

3.3.5.2 Aircraft Noise

Air Guard Jet Aircraft: No changes are proposed in the nature of operations of the air-to-ground ranges at Camp Shelby, therefore no changes in the noise levels resulting from this use may be anticipated. Intensity of use may, however, vary according to levels of funding available to the Air Force and Air National Guard for this type of training. Projected use, unconstrained by funding limitations which is not known, could rise by 25 percent to 32 percent between 1993 and 1999 (Appendix C, Part 6). The effect will not be one of increasing the noise generated by any one sortie to Camp Shelby, and these effects will continue as shown in Figure 3-19. The *number* or *frequency* of such flights, and the total levels of noise annoyance would increase proportionally.

Army Guard Helicopters: For the most part, operational noise associated with helicopters which are taking part in Army National Guard training activities will not change as a result of the proposed actions. The potential for added noise has been raised as an issue with respect to construction and use of the TAAs or tactical aviation areas (see Section 1.3.5 for a description of these areas). To examine this potential, a special study was performed by the Army Environmental Hygiene Agency (AEHA) using projected helicopter operational data, similar to those incorporated in the description of Army aviation training, Section 1.2.8.2. The detailed results of this study are presented in Appendix I. In summary, a "worst case footprint" was prepared (Figure 3-55A), which represents the flight patterns of the heavy lift company during Annual Training (AT), when the number of operations is greatest. This footprint, which forms a sort of rectangle about 1.5 miles long, represents the areas of potentially significant noise impact, i.e., Zone III and Zone II. This footprint was applied to each potential TAA (Figure 3-55B). In no case was a residence or other sensitive land use located within any of the zones, even if the footprint were to be rotated so it was oriented in a different direction. None of the proposed TAA locations may be considered unacceptable on the basis of potential for noise effects.

3.3.5.3 Vehicle Noise

The examination of this issue in Section 3.1.5.3 concluded this noise is greatest at the times when the largest numbers of vehicles are concentrated at Camp Shelby during AT periods and on weekends on about 14 other weekends a year. Vehicles such as tanks, trucks and armored personnel carriers cause the equivalent of "traffic noise" along certain fixed routes. Calculations based on accepted noise impact models show that this vehicle traffic results in

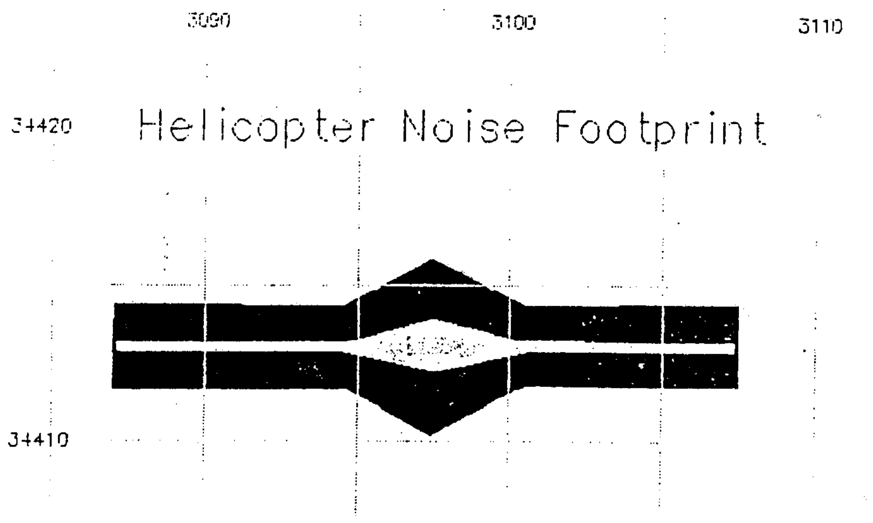

Figure 3-55A Helicopter Noise Footprint - Tactical Aviation Area

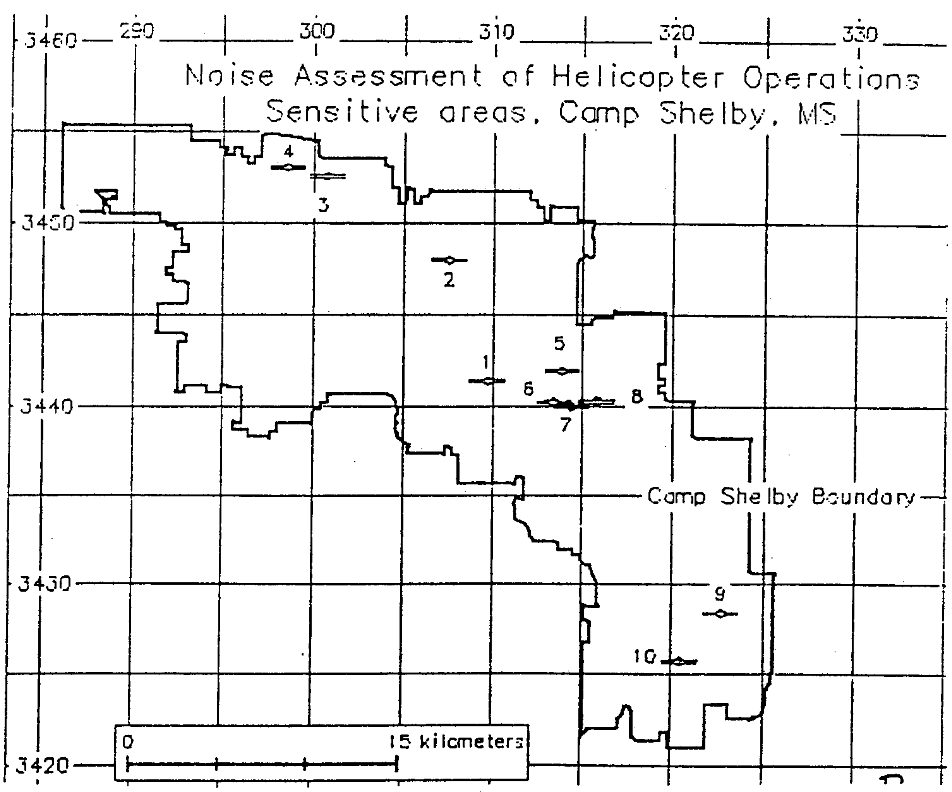

Figure 3-55B Analysis of Tactical Aviation Areas for Noise Incompatibility

"normally incompatible" zones, i.e., Zone II, (see Appendix I for a discussion of zones) in a strip about 35 feet wide on each side of the trail, and, beyond the "incompatible" zone there is an annoyance zone within which persons hear the traffic and may react with negative psychological or emotional reactions even though the noise levels are not damaging to hearing. This zone is less precisely calculable, and depends greatly on weather, vegetation and time of day, but extends approximately 500 to 600 feet from the trail. Geographic Information System analysis indicated that there are no residences within this "annoyance" zone at present (see Section 3.1.5.3), nor are there any associated with development of the proposed training areas. There will be, however, some number of persons who will experience more military vehicle traffic, and therefore noise, as vehicles travel to Proposed Training Area (PTA) 1, and other areas in the southeast portion of the Camp Shelby area where few or no tracked vehicles have been used for 20 years. More persons will be *exposed* to vehicle movement and field training noise than previously. While this cannot be exactly modeled or quantified, there will thus be some increase in those persons, resident near the training areas, who will note or hear military vehicles in travel or maneuver. To the degree to which this activity is perceived as a new and intrusive noise source, there may be said to be some increase in noise effects caused by Alternatives 1 and 2. Since Alternatives 3A and 3B will largely utilize those portions of Camp Shelby in which tracked vehicle maneuvers have been conducted regularly for many years, and have many fewer nearby residents, no noise effects are anticipated from their selection.

3.3.6 Leaf River Wildlife Management Area (LRWMA)

The LRWMA contains a total of 43,535 acres. The actions involved with the development of the LRWMA for training purposes will result in the modification (clearcutting, thinning) of a portion of that area. Under Alternatives 1 and 2 a total of 22,728 acres have been designated as the action area. This constitutes approximately 52 percent of the total acreage of the LRWMA. Of that area consisting of 22,728 acres, 8,540 acres (37.6%) will be clearcut and 3,827 acres (16.8%) thinned to facilitate training activities. The remaining 10,361 acres (45.6%) of the action area will not be affected. All other alternatives will not affect the LRWMA.

The changes brought about by timber clearing and thinning are presented in a series of graphics. The major timber species and species groups are similar to those developed previously. Longleaf pine is clearly more affected by Alternatives 1 and 2 than other species or species groups with 8,514 acres (68.8%) cleared and thinned of the total 12,367 acres which would be modified. Slash pine follows with a total of 1,911 acres (15.5%), hardwoods with 752 acres (6.1%), pine-hardwood mix with 340 acres (2.5%), and loblolly pine with 266 acres (2.7%) cleared and thinned.

The clearing and thinning will be spread across most age classes for each species or species group. Figures 3-56 through 3-60 show the percentage of each age class of the major species and species groups that will be clearcut, thinned, or have no modification. Some species or species groups do not have all representative age classes and are not depicted in the graphs.

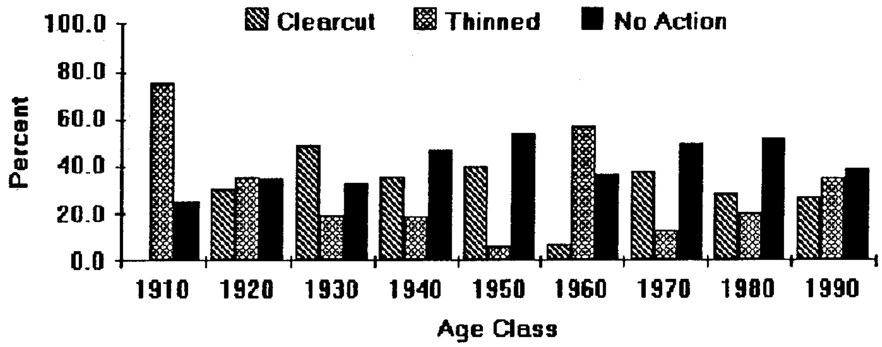

Figure 3-56 Percentage of Total Longleaf Pine Stands by Age Class that Will Be Clearcut, Thinned, or Have No Modification in the Action Area under Alternatives 1 and 2 in the Leaf River Wildlife Management Area

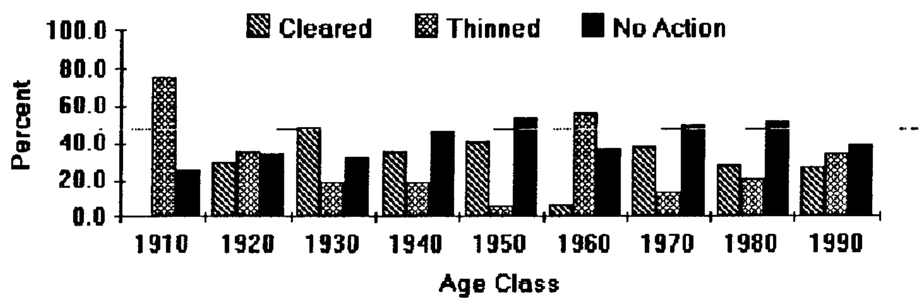

Figure 3-57 Percentage of Total Loblolly Pine Stands by Age Class that Will Be Clearcut, Thinned, or Have No Modification in the Action Area under Alternatives 1 and 2 in the Leaf River Wildlife Management Area

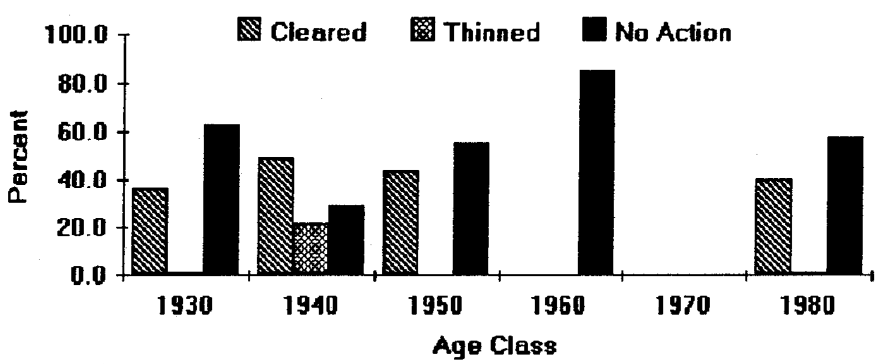

Figure 3-58 Percentage of Total Slash Pine Stands by Age Class that Will Be Clearcut, Thinned, or Have No Modification in the Action Area under Alternatives 1 and 2 in the Leaf River Wildlife Management Area

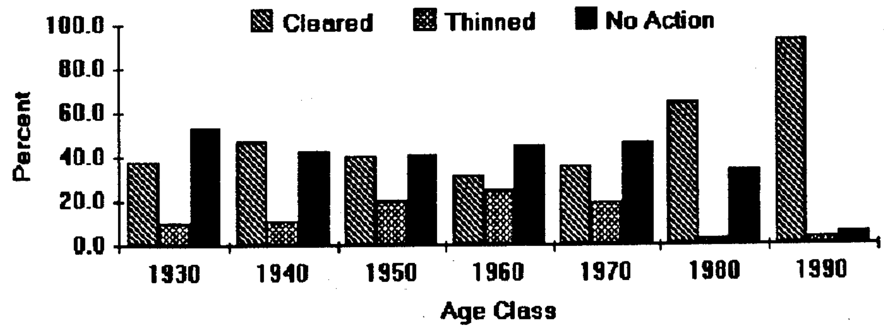

Figure 3-59 Percentage of Total Mixed Pine-Hardwood Stands by Age Class that Will Be Clearcut, Thinned, or Have No Modification in the Action Area under Alternatives 1 and 2 in the Leaf River Wildlife Management Area

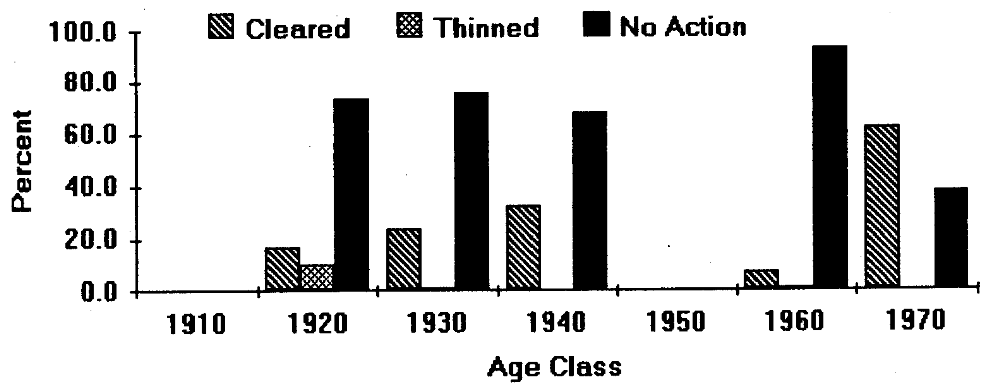

Figure 3-60 Percentage of Total Hardwood Stands by Age Class that Will Be Clearcut, Thinned, or Have No Modification in the Action Area under Alternatives 1 and 2 in the Leaf River Wildlife Management Area

3.3.7 Hazardous Waste Management

Camp Shelby maintains good procedures for managing those hazardous wastes which are generated as a result of ongoing training and maintenance activities (see Section 3.1.7). Since no significant increase is proposed in numbers of troops or vehicles, or changes in types of equipment or weapons, no change in waste generation is anticipated. All waste disposal and treatment will continue to be off-site, performed at licensed locations by licensed contractors who specialize in this work.

3.4 Proposed Mitigation Procedures

The proposed mitigation procedures described below are in addition to those now used at Camp Shelby. They are specifically designed and planned to alleviate the problems which have been identified as potentially resulting from implementing the proposed action.

3.4.1 Extension of New Integrated Training Area Management (ITAM) Procedures

The ITAM program is designed as a standardized, relational program that facilitates management decisions at the installation, major command or army level. However, the program is flexible enough to integrate, and work in concert with additional site specific measures as needed, such as those described below.

3.4.2 Prediction of Soil Loss and Sedimentation

The addition of 100-foot grass buffers to the PTA analysis (see Section 3.3.1.4) reduced estimated soil losses by about 15 percent. With the additional restriction on tracked vehicle maneuvers on slopes greater than 10 percent, while affecting only small areas, there is a further reduction of about 20 percent.

Deposition analyses were also conducted. Figure 3-61 shows the effects of adding a 100-foot grass buffer around the watercourses. The dark areas indicating deposition definitely moves away from the watercourses between no mitigation and grass buffers only, indicating that the buffers are forcing deposition prior to the runoff entering the watercourse. This reduces water quality effects, though consequences of loss continue in the remaining erosional areas. The need for temporary erosion control during construction is indicated by the difference between the treatments with and without revegetation of about seven times (0.11 vs 0.74). When the model is applied to the entire Camp Shelby training site, and all proposed mitigation measures, other than structural, are taken into account, the following pattern of soil losses is seen, where High Loss means more than 10 tons/acre/year, and excessive loss means more than 50 t/ac/yr. These areas coincide with current and proposed track training areas.

Ranking Factor	Alt 1	Alt 2	Alt 3A	Alt 3B	Alt 4
Average Loss (ton/Ac)	0.52	0.47	0.30	0.31	0.28
Ac High Loss (ac)	6,323	5,424	2,506	2,791	3,355
Ac Excessive Loss (ac)	479	429	290	305	189

These results show that spot placement of erosion control structures such as sediment traps, diversion terraces, and silt fences must be used during both construction and training use of the areas. The predicted location(s) of the areas of high and excessive loss will be used to locate sites for these structures.

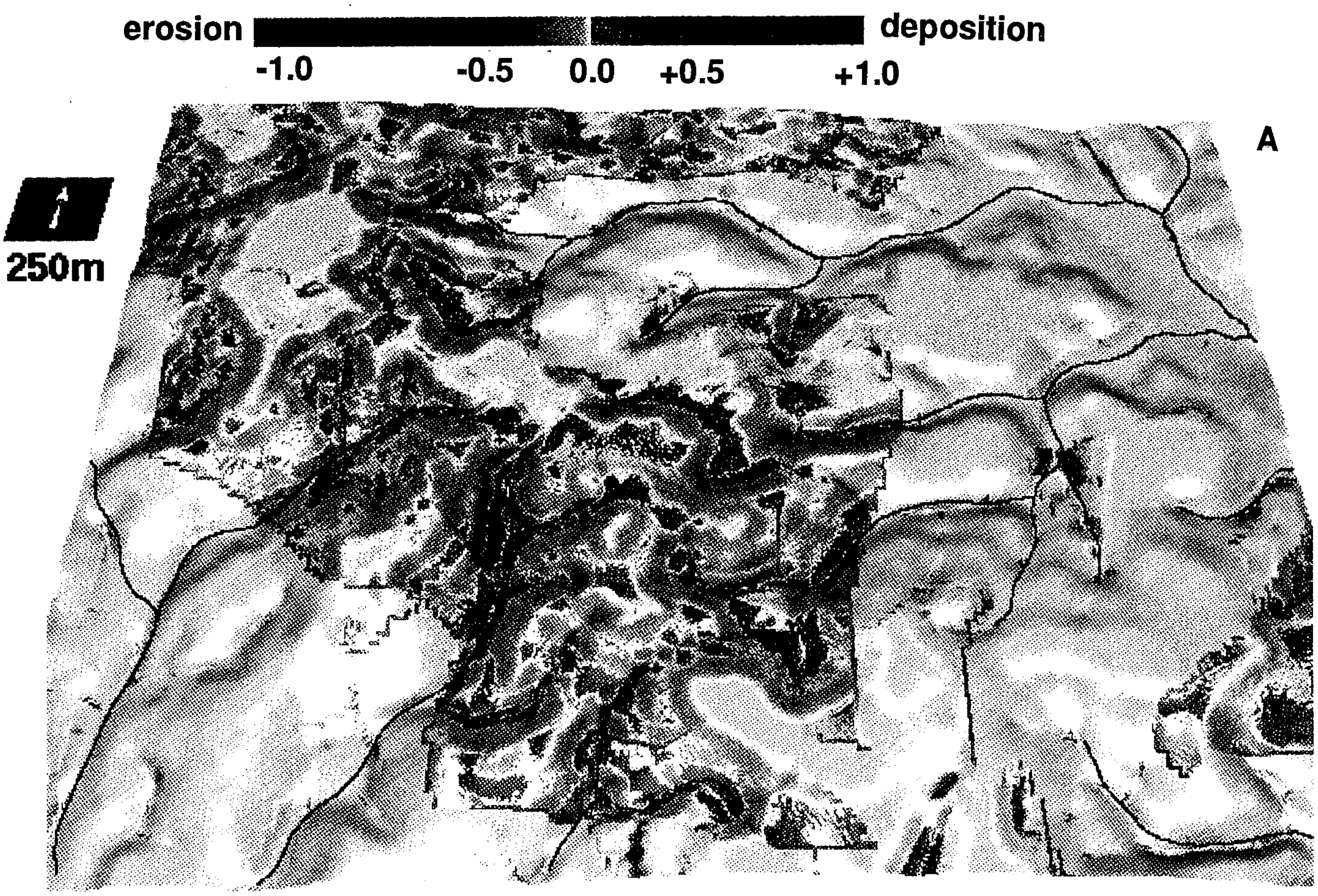

Figure 3-61A Predicted Soil Loss and Deposition with No Wetland Buffer Strip

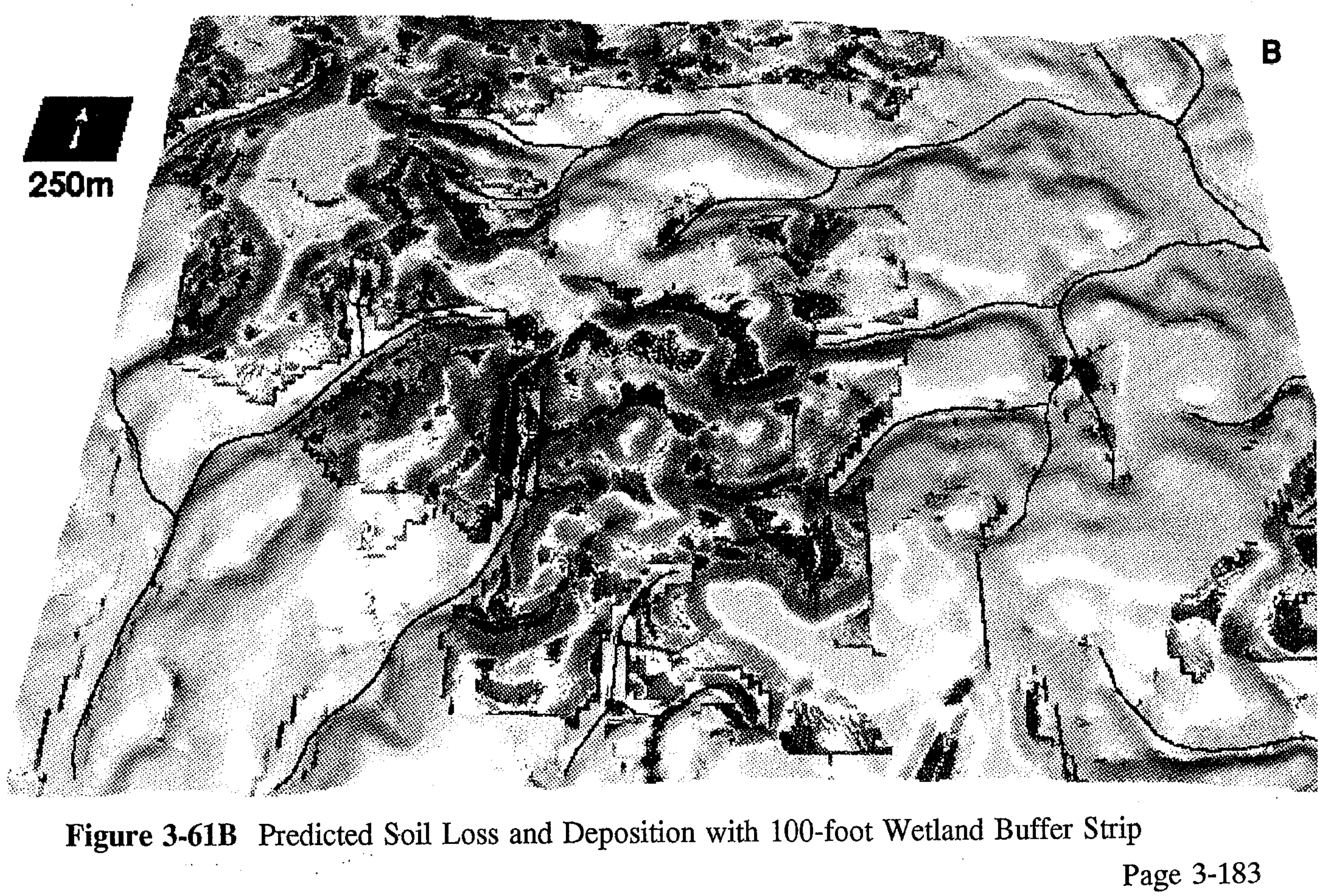

Figure 3-61B Predicted Soil Loss and Deposition with 100-foot Wetland Buffer Strip

3.4.3 Prevention of Soil Loss or Damage

Training activities will always have the *potential* to damage soils, similar to the potential associated with movement of construction equipment and forest harvest equipment. However, active planning, sound decisions during training and appropriate rehabilitation will mitigate most, if not all, long-term effects. Appropriate decision tools and training will be required to mitigate soil damage as a problem in the proposed training areas on Camp Shelby. As described in Section 3.2.3, environmental awareness training is part of the training activities. Appropriate site specific decision tools are being developed as part of the ITAM program to prevent excessive soil damage.

3.4.3.1 Use of Decision Matrix

A decision matrix, represented by the flowchart in Figure 3-62, has been developed as a result of special studies for the EIS process to assist in conducting appropriate training while maintaining the integrity of the soils in the training areas. Each decision point in the flowchart requires information to make informed choices that affect the available training activities and areas and affect subsequent environmental maintenance. The District Ranger and the Training Site Supervisor will use this decision matrix to determine appropriate training restrictions.

The first decision to be made in the flowchart is whether soil conditions are "dry", "normal", or "wet." Specific, objective information is not yet available for this decision, but subjective evaluations have been made in the past. These decisions will continue to be made, but specific data is proposed to be collected to ascertain the soil moisture conditions that cause the "dry" or "wet" decisions to be made. Critical soils for the "wet" decision include Susquehanna and other fine-textured, somewhat poorly drained soils.

A "dry" decision causes dust and fire hazards to be monitored more closely and control measures to be implemented as needed. The fire hazard will be evaluated as an actual U.S. Forest Service (USFS) fire hazard. If the fire hazard is greater than C+, a helicopter with a water bucket will be readied for use as necessary.

A "wet" decision causes training to be limited and leads to a subsequent decision on "very wet" soil conditions that, if they are deemed to exist, leads to more restrictions on training, including a limitation on tracked vehicle movement. Alternative training activities are and will be developed to allow productive use of Camp Shelby facilities without damaging its soil resources.

Regardless of any decision points shown within the flowchart, temporary erosion controls will be implemented as needed and permanent controls will be monitored for necessary emergency repairs. Hotspots are monitored and rehabilitated as soon as possible. After the last annual training period, all areas begin their annual rehabilitation as needed, with weekend training continuing on non-rehabilitated areas as available.

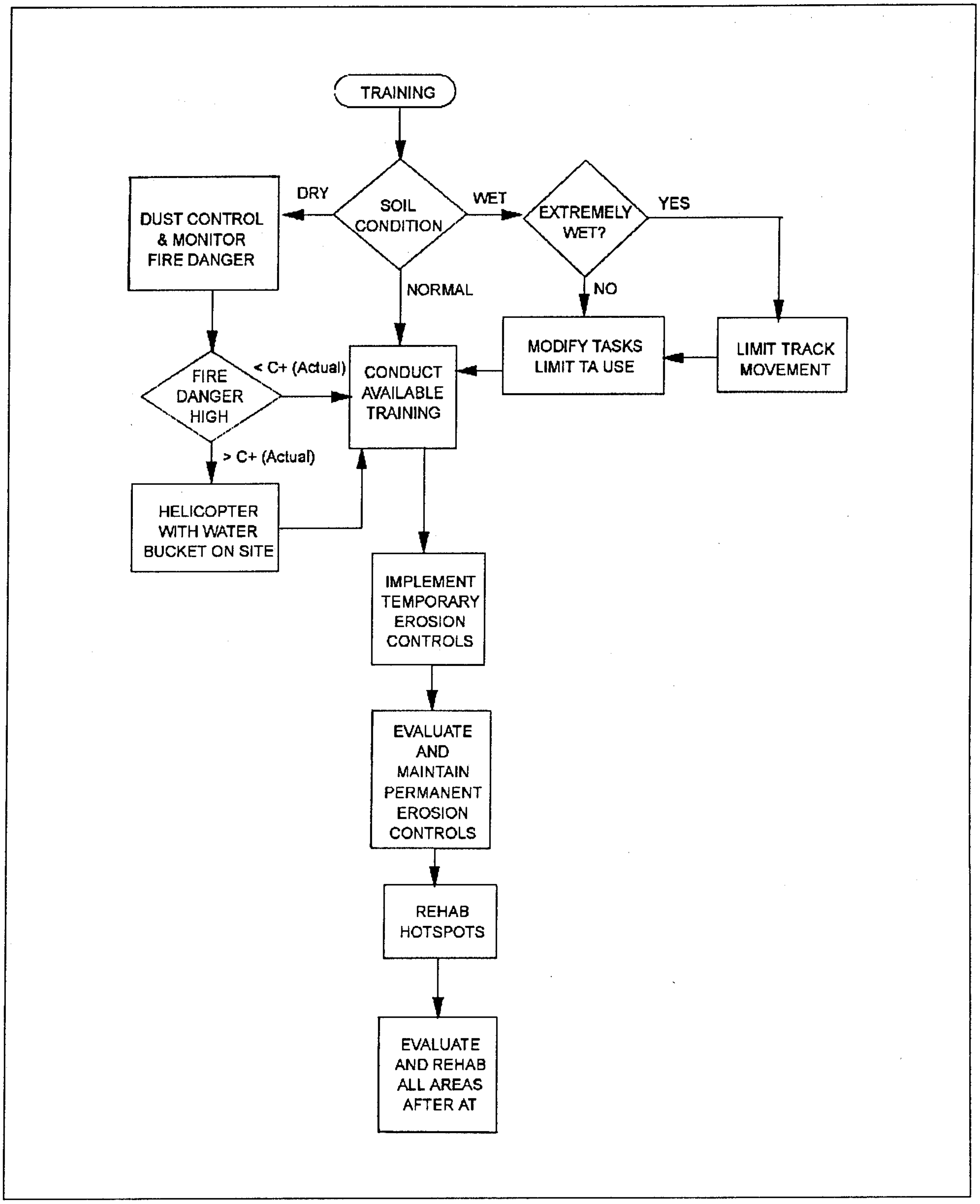

Figure 3-62 Decision Matrix Proposed for Maneuver Training

3.4.4 Expanded Erosion Control Program

Because military training has the potential to cause severe damage to vegetation and soils, Camp Shelby has developed a program for erosion control and restoration of training lands. Agronomic measures are practiced to revegetate disturbed areas, and conservation structures are installed where and when appropriate. However, there are still several problem areas where soil erosion problems like soil compaction, lack of vegetative cover, sheet and gully erosion, and siltation of wetlands do exist and need for remedial measures is acknowledged. Camp Shelby will execute all components of Integrated Training Area Management (ITAM), including Land Rehabilitation and Maintenance (LRAM). U.S. Army Construction Engineering Research Laboratory (USACERL) will provide the necessary professional assistance. USACERL is involved in active research and field implementation of advanced erosion control technologies that include the use of watershed analysis, land-forming methods, materials, structures, and soil bioengineering techniques. These technologies are expected to enhance the Army's training land use capability by providing efficient and cost-effective means and methods for the maintenance and stabilization of land-use areas to be compatible with Army training activities.

As part of the ITAM program, USACERL has developed an Erosion Control Management Plan (ECMP) to provide guidance in reducing soil erosion, resource loss, stream pollution, and offsite sedimentation at Army training facilities. This plan is incorporated into the existing Camp Shelby Erosion Control Plan. USACERL Technical Report N-90/11, July, 1990, ECMP provides a standardized methodology for each step involved in the identification of erosion control projects. This plan consists of a five-step procedure for problem identification, needs assessment, and erosion control technology selection. The ECMP assists the user in technology selection for new erosion control structures and systems and prescribes maintenance and repair procedures for existing ones. The objective of this work is to develop an erosion control management plan for Army training lands that encompasses both maintenance and repair of existing erosion control structures/systems and cost-effective selection of new technologies based on conditions unique to the installation's eroded sites.

The ECMP contains five steps for problem identification, needs assessment, and erosion control technology selection. These steps are as follows:

- Conduct preliminary site assessment for compiling an inventory of erosion project sites
- Identify erosion-related natural factors
- Examine site erosion conditions and contributing factors
- Assess erosion control needs
- Estimate costs for erosion control selection and resource requirement projections

These five steps are designed for selecting erosion controls at sites where no constructed erosion controls exist or where existing ones must be replaced. Detailed maintenance procedures for existing erosion control structures and systems appear in Appendix A of the ECMP.

Step 1, the preliminary site assessment, is performed to categorize sites into groups according to erosion control treatment approach. This step allows early identification of severely eroded sites that should receive high priority for rehabilitation as well as organization of resource requirements for lower priority sites.

Steps 2 and 3 are implemented during a detailed site assessment. This assessment may be performed concurrently with Step 1. Steps 2 and 3 are not required for every eroded area, only those that will require mitigation measures beyond routine planting and seeding. Mitigation measures involving revegetation only are discussed in Section 3.4.4.1. Step 2 involves identifying the prevailing erosion-related natural conditions of an area. These include consideration of general climatic conditions for all or part of the installation and identification of site-specific erosion-related natural conditions such as soil characteristics, topographic factors and vegetation. Step 3 involves close examination of the actual erosion conditions and how natural and human factors have contributed to them. Much of this data will ultimately be used to determine design specifications for the conservation structures and systems selected.

Using the information gathered during the problem identification procedures above, Step 4 involves a determination as to: 1) what measures and/or structures are needed at the site to control the erosion processes and; 2) which of those controls are appropriate for natural conditions and training compatibility requirements. Step 4 also involves the quantification of soil loss or runoff and sediment yield to determine to what extent erosion control is needed at the site. This information can be used along with other considerations in prioritizing restoration of eroded sites.

USACERL scientists have designed (to ca. 50%) sediment control measures for all soil movement that may take place during construction and operation of the range to effectively reduce sediment from entering Poplar Creek, its tributaries or the associated wetlands (see Table 3-19). A summary of applicable erosion control methods, materials, structures and systems is presented in both the USACERL Technical Report N-88/05, May 1988, Erosion Control Methods for Army Training Land Rehabilitation: Survey of Current Technology and the Erosion Control Plan for Camp Shelby, Mississippi, discussed in Section 3.2.2.

In Step 5, erosion controls that have been identified as functional for controlling the erosion processes present, appropriate for natural conditions, and compatible with training requirements, are compared in terms of cost. Cost elements examined relate to both initial construction as well as maintenance and repair. The purpose of performing this cost comparison is to identify the least costly, most appropriate erosion control. Selection of the least expensive technology, however, is not mandated. In cases for which a given control is judged more appropriate for site conditions or provides many more benefits than a less costly, yet still appropriate alternative, the additional benefits are examined closely and valued within the framework of existing budgetary constraints.

3.4.4.1 Revegetation

The first line of defense in protecting soils from erosion is the vegetal cover. The role of vegetation in the retarding of soil erosion, and the providing of soil aeration and humus can not be over emphasized. Therefore, through adequate funding and full implementation of Integrated Training Area Management (ITAM), Camp Shelby will try to maintain full vegetation establishment on all disturbed lands. To further emphasize the need and urgency for the revegetation of disturbed lands at Camp Shelby, the effectiveness of vegetal cover in processes of soil and water conservation is described in the following sections.

Vegetation protects surface soils by preventing wind, splash, and rill erosion. Ground cover intercepts raindrops, absorbs rainfall energy, reduces particle detachment, and lowers runoff velocities. Root systems bind and stabilize soil particles and combine with plant residue to increase soil porosity and infiltration. In addition to rooted groundcover plants, canopy foliage and leaf and stem "litter" prevent the soil surface from sealing from raindrop impact.

The shielding effect of a plant canopy is augmented by roots and rhizomes that hold the soil, improve its physical condition, and increase the rate of infiltration, further decreasing runoff. Plants also reduce the moisture content of the soil through transpiration, thus, increasing its capacity to absorb water.

Suitable vegetative cover affords excellent erosion protection and sedimentation control and is essential to the design and stabilization of many structural erosion control devices. Vegetative cover is relatively inexpensive to achieve and tends to be self-healing; it is often the only practical, long-term solution to stabilization and erosion control on most disturbed soils at Camp Shelby.

Planning from the start for vegetation stabilization reduces its cost, minimizes maintenance and repair, and makes structural erosion control measures more effective and less costly to maintain. Post-construction landscaping is also less costly where soils have not been eroded, or slopes are not too steep.

Besides preventing erosion, healthy vegetative cover provides a land surface that absorbs rainfall, reduces heat, reflectance and dust. It also provides a microclimate for wildlife food and refuge. The result is a pleasant environment for trainers and attractive sites for recreation.

Another benefit of the proposed intensive revegetation program, when combined with structural erosion measures where necessary, is in improvement of surface water quality. As discussed on Section 3.3.1.5, an increase in cleared and thinned areas has the potential for higher peak runoff and alteration of stream channel morphology. Strong riparian management (riparian forest establishment, restoration, and protection) is proposed to alleviate this problem.

3.4.4.2 Implementation Plan For Training Land Rehabilitation And Maintenance (LRAM)

The Army's environmental goal for training land management is to restore training lands to an acceptable condition and maintain them over the long-term. The Integrated Training Area Management (ITAM) program has a Land Rehabilitation and Maintenance (LRAM) component to provide guidance and technology for the planning, design, and implementation of land restoration projects and the establishment of long-term land maintenance programs. Sufficient guidance and technology are available to initiate implementation of the LRAM component of ITAM. This plan is being designed to accomplish LRAM implementation at Camp Shelby.

LRAM Installation Capabilities: LRAM guidance and technology will support installation land restoration and maintenance for --

- Improvement of vegetation cover to enhance training area realism
- Improvement of vegetation cover to reduce soil loss and protect long-term soil productivity
- Control of runoff to reduce soil loss and protect riparian resources
- Repair of gullies and other landscape damage for safety and continued availability of land for training use
- Control of sediment transport to protect riparian resources and comply with water quality standards

Activities that must be accomplished to complete land restoration and maintenance projects include --

- Site assessment
- Determination of LRAM objectives
- Selection of appropriate technology
- Coordination with trainers and other agencies
- Establishment of priorities
- Development of project plans and cost estimates
- Placement of projects into the Annual Work Plan
- Selection of the method of accomplishment
- Initiation of construction projects
- Execution of maintenance programs

Development of land restoration and maintenance plans can be accomplished by personnel with skills such as soil/water conservation and watershed management. For efficient execution and management of construction projects, installations need personnel with civil/agricultural engineering skills.

Implementation Approach: The implementation plan for land restoration and maintenance has two elements, staffing and training. The recommended staff is a GS 9/11 Civil/Agricultural Engineer or Soil Conservationist with a background in, watershed management or land restoration. It may be possible that LRAM planning can be accomplished using existing staff or staff provided through implementation of other ITAM components.

The training element is accomplished in three phases. Phase I is the primary technology transfer phase in which installation personnel learn LRAM procedures and prepare their first watershed restoration plan (Phase I is described in detail in Section 3.4.4). Phase II involves the implementation of the plan at the installation. Cost of implementation will depend on the results of Phase I.

Phase III involves long-term maintenance programs. Maintenance is expected to consist of inspections, reseeding and minor construction. As additional LRAM projects are completed, more maintenance will be required.

3.4.4.3 Water Quality Monitoring

A primary concern of the U.S. Forest Service and the public is the protection of streams and wetlands from sedimentation and other pollutants that can impair aquatic ecosystem integrity. Rather than be subject to allegations of aquatic system impacts based on subjective criteria, a program was developed to monitor water quality and sediment transport in order to characterize conditions on the installation and assess the effectiveness of alternate land rehabilitation methods (erosion control). The monitoring is important for projected training areas because it will document before and after training impacts.

A water quality monitoring network was initiated in July, 1991. The network is designed to characterize water quality and sediment transport at Camp Shelby. Personnel from the University of Southern Mississippi in conjunction with researchers at USACERL began measuring water chemistry and sediment transport at selected stream locations throughout the installation as part of a water quality assessment and monitoring project. The project has two research components. The first component consists of water quality monitoring at 47 stations around the perimeter of Camp Shelby. This design was selected to determine if water quality, as found in streams leaving Camp Shelby, was in any way abnormal. Water samples have been collected twice annually since July, 1991. Seventeen water quality parameters are monitored including biological oxygen demand, chemical oxygen demand, nitrite, nitrate, total Kjeldahl nitrogen, dissolved phosphorous, total phosphorous, potassium, fecal coliform, total solids, dissolved oxygen, temperature, pH, turbidity, chlorophyll A, alkalinity, and hardness. The second component involves six stations. The same seventeen parameters are monitored at these sites, however, sampling is performed on a monthly basis and includes sediment monitoring. The first four initial sediment monitoring stations were located on Poplar, Middle, and Pierce Creeks -- close to the place where they leave Camp Shelby -- and on Bluff Creek as it exits Camp Shelby northwest of Beaumont. Two other sediment stations are near the cantonment area to monitor conditions at locations not having training or maneuvering impacts. The monitoring network will be redesigned after August,

1994, following analysis of the data collected since July, 1991. Annual screening for explosives residues and heavy metals will be added to the plan. This reconfiguration will focus on areas to be modified for future training but will also reflect ongoing activities.

The information derived from the water quality/sediment monitoring project will help measure the impact of training and differentiate between natural sediment transport and that produced as a result of training activities. The program will also complement erosion control efforts by providing evidence of the effectiveness of the land rehabilitation program. This information can be used to determine the most effective and least costly erosion control methods.

3.4.5 Wetland Protection

3.4.5.1 General Protection Principles

Sediment transport from upland training areas has a potential for causing problems of excessive silting in many areas of wetlands. Deep deposits of silt cause a "choking" effect on the trees and other plant species in the wetland by depriving oxygen supply to the root zone. Sediment controls will be constructed and wetland buffer zones created to minimize sedimentation within wetland areas. The designing of buffer zones is discussed in Section 3.4.5.2. U.S. Construction Engineering Research Laboratory (USACERL) will help in providing an engineering design for sediment controls and buffer zones through ITAM as described in Section 3.4.4. An additional general protection measure which may be applied is that of scheduling earthmoving and disturbing actions, such as roadbuilding and utility line extension, to those times of the year when soils are relatively dry.

3.4.5.2 Vegetation Buffer Strips

The deposition of sediment in vegetative filter strips is a function of many variables which describe flow characteristics, sediment characteristics, topography and, the condition and size of the filter. Primary concern at Camp Shelby is the effectiveness of the vegetative buffer.

Buffer strips (100-foot wide) will be utilized where they are specified throughout Camp Shelby to protect areas from sediment of sand size. Current guidelines indicate that a 30-foot buffer width would be sufficient in areas with overland slopes of up to 2 percent, for areas with slopes greater than 2 percent a buffer measuring 30 feet plus 1.5 times percent slope is recommended. There are no slopes on Camp Shelby greater than 44 percent; therefore, the more conservative and easier to apply 100-foot width will be used throughout to afford greater protection.

Vegetative filter strips are not actually very effective in capturing sediment that is silt size and smaller (less than .05 mm), once the soil is saturated. This method of sediment capture is used primarily in areas receiving concentrated flows which are extremely heavily laden with sediment, a significant portion of which is the larger particle sizes. Sheet flow transports primarily the smaller particle sizes, and they are well-suspended in the water.

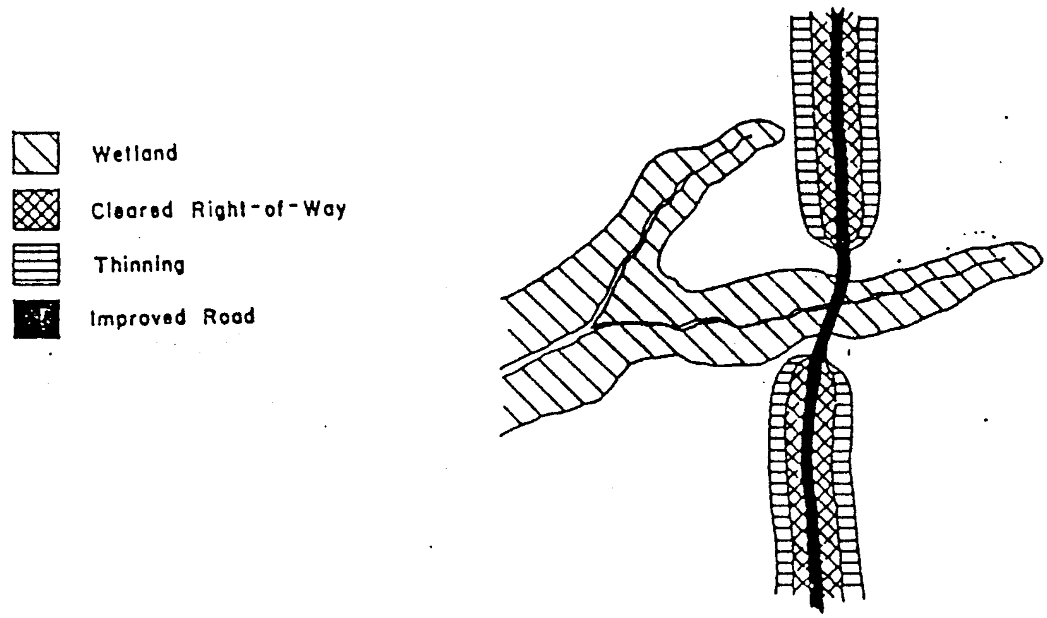

Figure 3-63A Proposed Plan for Minimizing Wetland Disturbance at Maneuver Corridor Crossings

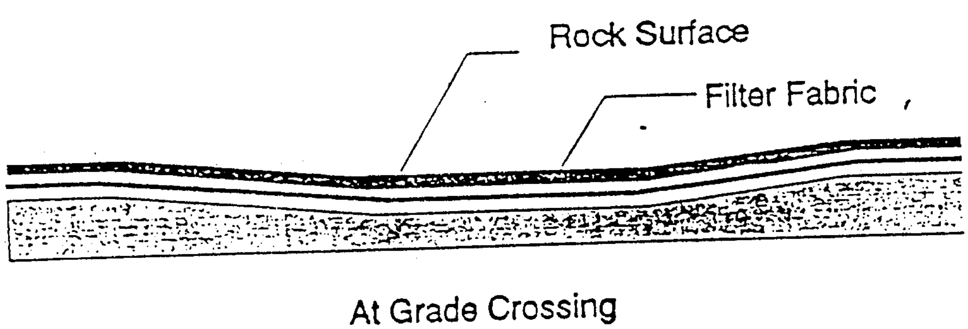

Figure 3-63B At-Grade Crossing Recommended for Wetlands with Ephemeral Flow of Surface Water

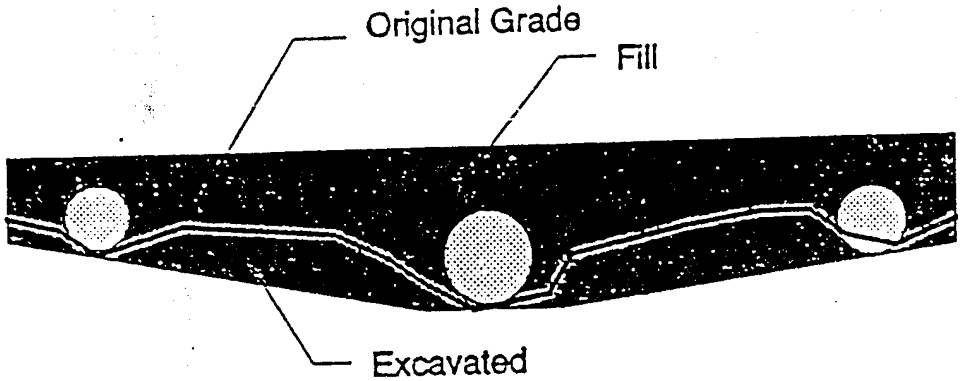

Figure 3-64A At-Grade Crossing Recommended for Wetlands with Intermittent Flow of Surface Water

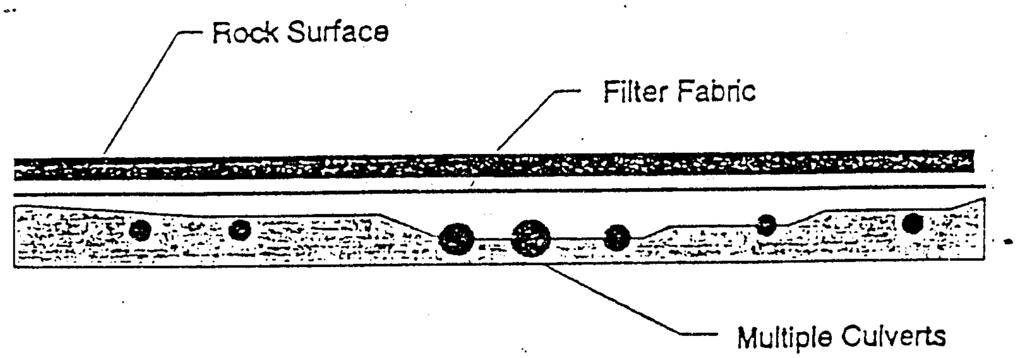

Figure 3-64B Improvement Required Where Wetland is Associated with Substantial Water Flow

Vegetative filter strips can be effective when applied at specific locations, such as the upper reaches of drainage ways or other locations where flow is concentrated. Site specific designs will be required to install effective vegetative filters at these locations, and will be prepared as a part of Integrated Training Area Management (ITAM) implementation. The erosion control effectiveness of vegetative filters is highly site and slope specific and the design for their use must consider many variables related to flow rates, incoming sediment concentrations and sediment size distribution. The primary benefit from vegetative buffer strips at Camp Shelby would be in helping to keep vehicle traffic a safe distance away from sensitive areas. These will be utilized in all alternatives, as described in Clause 21 of the proposed Special Use Permit (Appendix A).

Alternate methods of erosion control could be more effective than vegetative buffer strips. Even with vegetative buffer strips it will certainly be necessary to use additional erosion control measures, including structural features such as check dams, terraces, and water bars, where the requirement exists. Specific erosion control measures are listed by function in both the USACERL Technical Report N-88/05, May 1988, Erosion Control Methods for Army Training Land Rehabilitation: Survey of Current Technology and the Erosion Control Plan for Camp Shelby, Mississippi, discussed in Section 3.2.2.

3.4.5.3 Wetland Crossing Design

Improved stream crossings are important for training and environmental protection. Riparian areas have soils with higher soil moisture content and can become untrafficable after only a few passes of tactical vehicles.

Riparian areas usually contain important habitat, and wetlands are protected by law. Vehicle traffic in and near riparian areas can cause environmental damage and contribute to water quality problems. The proposed mitigation procedures start with a recommendation for keeping the width and length of required wetland crossings to a minimum (Figure 3-63A).

The solution to these problems is to provide improved stream crossing points. Stream crossing design must consider cost, trafficability (ability of the structure to support tactical vehicle traffic), minimum damage to existing environmental features, and maintenance of natural drainage patterns. For example, Figures 3-63B and 3-64B show conceptual design of typical wetland crossings which are cost-effective, requiring a minimum amount of construction and providing efficient trafficability. In actual stream crossing designs, two types of structures are practical: at-grade crossings and culverts.

The high cost of bridges makes this option impractical for most tank trails, especially since some states regulate all bridge construction. For example, bridge construction at Fort McCoy using expedient military bridge construction methods was disapproved. However, as storm water design flows become large, bridges may have to be used. For most training area applications we are concerned with stream crossings in drainage areas being fed from small watersheds.

Cost is a function of materials, and the volumes of excavation and fill. At-grade crossings (Figures 3-63B and 3-64A) have the advantage of least cost because fill volumes are low and culverts are not used. The most important design consideration for at-grade crossings is that the size of the surface rock is sufficiently large (of the order of d_{50}=9" to d_{50}=12" - 9in to 12in diameter) to resist the shear forces generated by storm water flows. The site must be suitable for maintaining a broad, shallow stream channel, to allow for slower stream flow velocities.

One disadvantage of at-grade crossings is that the crossing point will be under water for some period of time for perennial and intermittent streams. Another concern is that the trail must be brought down to stream level, usually by cutting down through the stream banks. Care must be taken to divert or control roadside ditch drainage so that the trail itself is not a source of sediment.

Experience with improved at-grade stream crossings is limited. Few improved tank trail stream crossing points exist at military installations. Some have been constructed using concrete, a very expensive solution. The U.S. Forest Service has had success with temporary at-grade crossings and using confinement grids. However, the long-term effectiveness of this method has not been determined.

The use of culverts for improved stream crossings is standard engineering practice (Figure 3-64B). Design considerations for sizing culverts are well documented. One concern is the effect culverts may have on natural drainage problems. Most culverts cause backwater during storm water flows. This would tend to extend the area and duration of stream side flooding. Also, if culverts are located only in the center of the drainage way, then any secondary flow channels located in the floodplain will be blocked by the roadway fill. This would be a concern if wetlands are located along the floodplains because natural drainage patterns could be altered. Drainage problems could be avoided by placement of additional culverts in the floodplains (Figure 3-64B). Care must be taken to avoid clogging of the smaller culverts with debris and sediment.

One advantage of culverts is that the roadway grade can be maintained so that it is easier to control the drainage of roadside ditches. Also the roadway surface can be constructed of rock that is sized appropriately for traffic. The choice between culverts or at-grade crossings depends on site conditions. Streams characterized by wide floodplains, wide channels and low stream bank height are more suited to at-grade crossings. Steep, narrow channels and narrow floodplains are more suited to culverts.

3.4.5.4 Physical Barriers and Catchments

There may be areas within Camp Shelby where the localized topography will not allow a buffer strip to be fully effective in controlling sedimentation of a wetland or other water resource. In that case, specially designed diversions, terraces, or waterways may be necessary. These would need to be designed to move sediment-laden water to an

impoundment or other sediment control device to allow the soil particles being carried by the runoff to be removed before the water is released to a wetland or other water body.

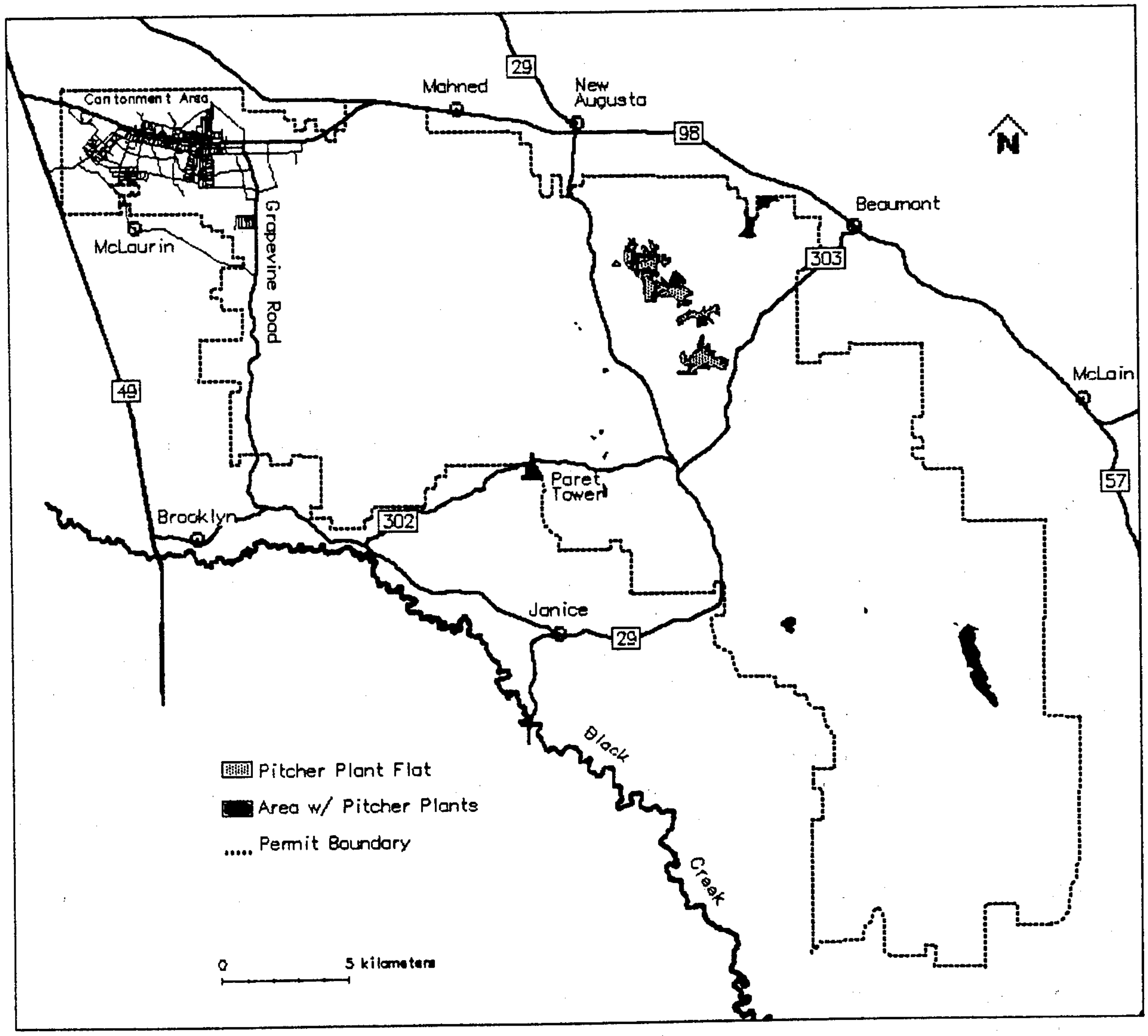

Figure 3-65 Pitcher Plant Bogs in the Camp Shelby Area

For example, "Pitcher Plant" bogs are present at various elevations in the proposed training areas (Figure 3-65). These bogs are particularly vulnerable to sediment inundation. Grass buffers may not be adequate, requiring diversions to be designed to keep sediment laden water from upsetting the balance of the bogs. Other areas requiring special consideration are steep banks along streams or near wetlands. Figures 3-61 A and B show that there is potential for deposition in close proximity to some water courses, even with buffers installed. These areas are candidates for site evaluations and potentially for physical structures. The erosion and deposition model (see Section 3.3.1.4) will be used to identify the need for, and general location of, such structures. Their detailed design will be a part of the detailed site analysis described in Section 1.4.

3.4.5.5 Management of Nutrient Losses

As discussed in Section 3.3.1.5.2, the greatly increased scope of revegetation and repair brings with it a potential negative consequence, that of loss of nutrients from leaching of the fertilizer applied. Managing revegetation practices in order to control the potential impact of Nitrate-N has been made feasible by the recent development of suitable computer programs (Maran, et al, 1992). These programs combine the expertise of plant cultivation, including the use of commercial fertilizers, with the expertise to calculate the potential impact that results from leaching and runoff. The potential impact is the amount of Nitrate-N that could be expected to leave the training area in a year of normal rainfall (Spalding, et al, 1990; Goolsby et al., 1991). This value can be used to establish the environmental soundness of revegetation practices.

An environmentally sound practice has a potential impact which lies within a range of acceptable values. The low end of that range is the potential impact of the existing natural revegetation process, and the high end is that potential impact beyond which pitcher plant bogs and flats would be irreparably harmed. Since revegetation practices utilize supplemental fertilizer, their potential impact values will be no less than that of the natural process; thus, environmentally sound practices are those having a potential impact no greater than the high-end value. While some data exists which could possibly be used to make an estimate (Eleuterius, et al, 1969), a scientifically verifiable high-end value has not yet been established. Until this occurs, the prudent course of action is to use those practices whose potential impacts are closest to the low-end value. This is the goal of environmental revegetation management.

The cover crop, the kind of fertilizer, and the time of application are three factors which significantly affect the potential impact (Barber, 1984; Gregory, 1987; Glass, 1989). Management controls the environmental soundness of its revegetation practices by the selection it makes for these three factors. The approach is to optimize one factor at the time in the following order: the cover crop, the kind of fertilizer, and the time of application. Stepping through the factors in this order results in a practice with the lowest potential impact or one very close to it. Each factor is optimized by stepping through its available options, computing the resulting potential impacts, and selecting the one with the lowest potential

impact among those options not ruled out for other considerations. The available options for each factor are given in Appendix S.

Table 3-43 Three Revegetation Practices

	* Cover Crop	** Kind of Fertilizer	Time of Application
Ideal Practice	Natural cover (20)	Organic matter	Naturally occurring
Current Practice	Type A grasses <20% legumes	Ammonium Nitrate (102)	At planting in the fall (78)
Optimum Practice	Type A grasses >30% legumes	Ammonium Nitrate (30+30)	Half at planting; half in spring

* Type A grasses: fescue, bermuda, bahia (low nitrogen requirements).
Legumes: lespedeza, vetch, clover.
The numbers in parentheses are the lbs/acre of seed mixture.
** The numbers in parentheses are the lbs/acre of Nitrogen.

Table 3-44 Potential Nitrate-N Impacts

Soil Type	Practice	Potential Impact (lbs/ac/yr)	(mg/liter)	Effectiveness
McClaurin	Ideal	3.77	10.09	1.00
(2-5% slope)	Optimum	5.80	15.52	1.54
	Current	22.65	60.54	6.00
Jena	Ideal	3.84	10.28	1.00
	Optimum	5.91	15.81	1.54
	Current	23.07	61.67	6.00

The effectiveness of environmental revegetation management is measured by the reduction in potential impact made possible by its use and by how close the potential impacts of its practices come to that of the ideal practice. To demonstrate the effectiveness of its use at Camp Shelby, their current revegetation practice was compared to the ideal practice and to an optimum practice obtained by using the approach described above.

The ideal practice was stated to be that of the existing natural revegetation process. To compute its potential impact, this practice is considered to be similar to an open meadowland not managed for agriculture which is part of the ecosystem around Camp Shelby. The

nutrients are assumed to come from organic sources and from electrical (i.e., thunderstorm) nitrogen fixing, an important source in this area. An estimate of 20 lbs/acre of organic matter was used to calculate the potential impact.

Identification of the optimum practice started with the choice of cover crop. Nine mixtures of grasses and legumes were considered. Grasses with low nitrogen requirements, those with high nitrogen requirements, and equal amounts of both were each combined with three different concentrations of legumes: less than 20 percent, no less than 20 percent and no greater than 30 percent, and greater than 30 percent. The selection with the lowest potential impact was any mixture of grasses with greater than 30 percent legumes.

The next step was selecting the fertilizer. Two of the options normally available agriculturally were ruled out by considerations other than potential impact. Ammonium Phosphate was ruled out because it adds a large amount of unneeded phosphate. Phosphate is also a nutrient that could migrate into pitcher plant bogs and flats through erosion. Also ruled out was Anhydrous Ammonia + N Inhibitor. The inhibitor is used to reduce leaching over the winter months from fertilizer applied in the Fall. This is not a major problem in Mississippi because of its long growing season. Of the remaining options, the split application (planting and ^Sprint) is the selection with the lowest potential impact.

Selection of the fertilizer application time is also an alternative examined. Three options normally available in agriculture were ruled out for reasons related to the training schedule. The Fall and Spring options have less meaning in southern Mississippi because of the long growing season. Post emergence application was considered impractical because the ground equipment used to apply the fertilizer would seriously disturb the cover crop. This leaves a partial application at planting time followed by a second small application when rapid ggowth resumes in the Spring (ca. 1 March) as the preferred timing.

With regard to its environmental soundness, a revegetation practice is characterized by the selections for its cover crop, fertilizer, and application time. The selections for the ideal, optimum and current practices are given in Table 3-43, and their resulting potential impacts are given in Table 3-44. As can be seen in the effectiveness column of Table 3-43, the potential impact can be reduced from 500 percent greater than the ideal value to only 54 percent greater by using environmental revegetation management.

3.4.5.6 Potential Mitigation for Loss of Wetlands

The different action alternatives propose that some small losses of wetlands will be necessary to construct road crossings of both intermittent and perennial streams. Detailed site engineering will not identify the exact locations or acreages until a later time, but the approximate locations and areas can be estimated. The estimates suggest that approximately 50 to 100 acres will be lost in total, and involve 10 to 20 locations, an average of about 5

acres per site. Several potential mitigation methods are proposed to compensate for the small amount of wetland that would be lost if one of the action alternatives is implemented. Any one or a combination of two or more of the following methods may be utilized to fully compensate for the proposed wetland loss. Discussions with personnel familiar with past history of wetland mitigation actions in southern Mississippi have suggested that the following five options provide an adequate range of options to fully compensate for the proposed loss.

Restoration: Restoring areas on Camp Shelby that were once wetlands but have been disturbed to the point that they no longer function as true wetlands. There are potentially areas on Camp Shelby that fall in this category, however, they have not all been identified or evaluated, and it is not known if the area or quality is adequate to fully compensate for the proposed losses associated with the action alternatives.

Enhancement: Improvement or enhancement of poor quality or marginal wetland areas on Camp Shelby is also a viable option. There are potentially some areas on Camp Shelby that fall in this category, however, it is again not known if the area or quality is adequate to fully compensate for the proposed losses associated with the action alternatives.

Greentree Reservoirs: Greentree reservoirs are created in floodplains of larger streams specifically to be managed for water fowl. The concept is to redesign the floodplain area so that it can be seasonally flooded to create proper wetland habitat conducive for migratory waterfowl. There are potentially one or two areas on Camp Shelby that could qualify for a greentree reservoir, and its creation and management would have to be closely coordinated among many state and federal agencies, including the U.S. Forest Service and U.S. Fish and Wildlife Service.

Cooperative Restoration: Cooperative restoration of disturbed wetlands in other locations around the state has been suggested as a particularly flexible compensation method. The state now operates a wetland bank program that buys and restores wetland areas around the State. This bank of wetlands is then debited when the highway department needs to take existing wetlands to maintain or construct new roads. The Mississippi National Guard has trained engineering units in several locations in the State that could potentially provide the engineering design and earthmoving capabilities often needed for restoration of wetland areas to be placed in the bank. This option not only provides the state with a service for wetland restoration it provides the engineer units opportunities to train and use their skills in a productive activity.

Purchase of Habitat: The Mississippi National Guard could purchase, or contribute cooperatively in concert with other agencies toward the purchase of, significant wildlife habitat which is not now protected. Such properties are now maintained by some Federal Government agencies as a "habitat bank" against which losses of habitat may be debited. No specific property or location is proposed at this time, and the location(s) of suitable properties is normally the option of the administering agency, which takes title to the property.

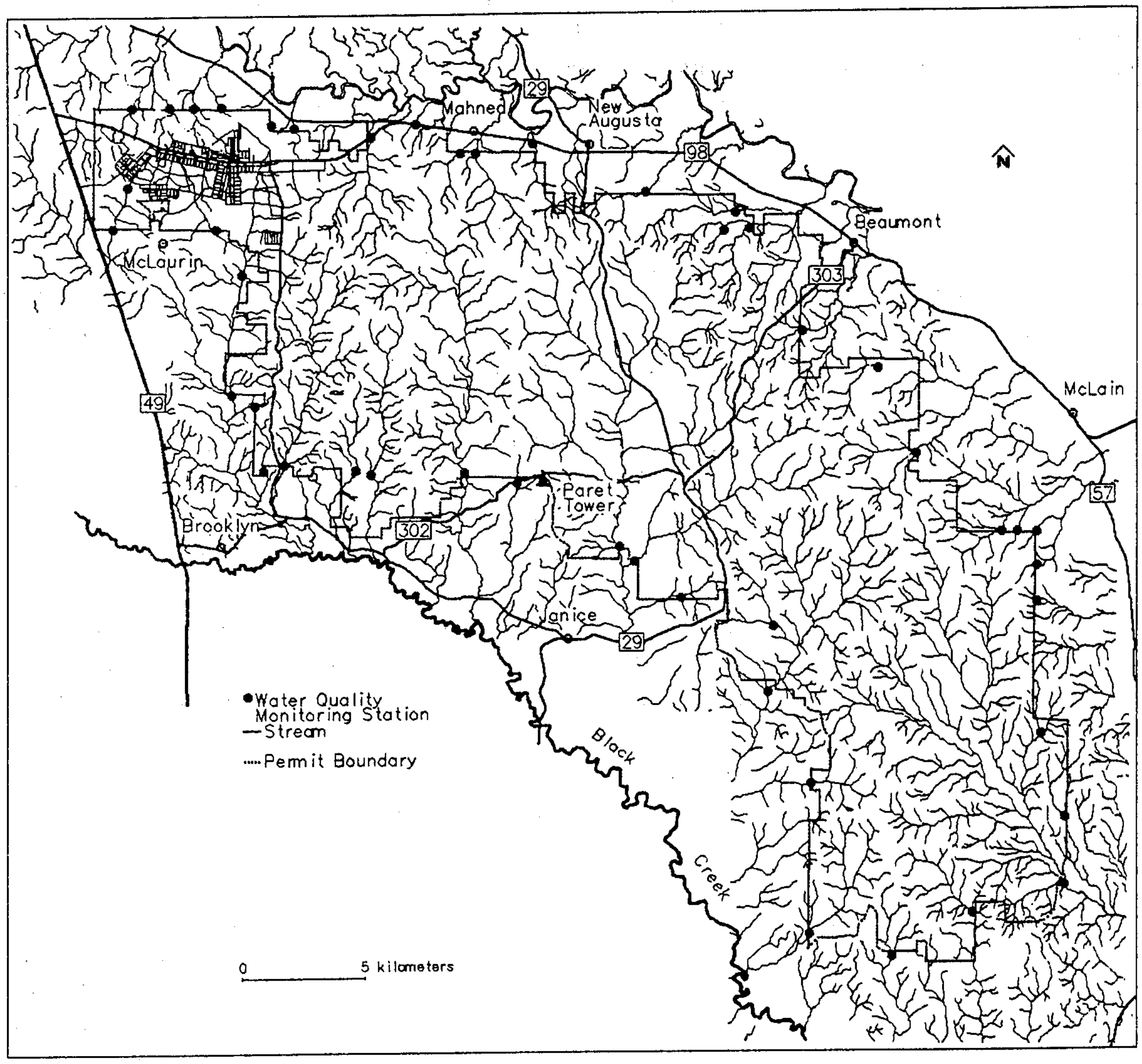

Figure 3-66 Water Quality Monitoring Stations on Camp Shelby

3.4.6 Management of the Environment

Management of the environment will be achieved by implementing the proposed mitigation plans discussed above and monitoring the results of both the present and proposed mitigation procedures. Long term monitoring of the results of the mitigation procedures will provide a quantitative measure of the their efficacy. Based on these data, appropriate adjustments can be made to the procedures to improve management or appropriate protection of the

environment and sustain realistic training for the National Guard. This process is developed and the separate parts will be integrated and coordinated through the Integrated Training Area Management (ITAM) program.

3.4.6.1 Implementing Mitigation Plans

With three of the five thrust areas of the ITAM program fully implemented (land condition trend analysis or LCTA, environmental assessment, decision support) and Land Rehabilitation and Maintenance (LRAM) and training requirements integration (TRI) being in the implementation phase, the process for implementing the following mitigation procedures is functional. Much of the baseline information regarding the basic resources (vegetation, wildlife, threatened and endangered or T&E species, soils and wetlands) has been quantified and provides the foundation for developing management and mitigation plans. There are over 200 permanently located transects on Camp Shelby, from which vegetation, wildlife, T&E species, soils and wetland data are being collected and analyzed each year. When and where appropriate, special use transects will be added to inventory and monitor areas of special concern, for example the proposed maneuver areas associated with one of the proposed action alternatives. Data collection has begun to initialize the parameters within the decision matrix so that it will be functional prior to any of the action alternatives being implemented. Erosion control and wetland protection measures are developed and being effected, aquatic monitoring and biomonitoring procedures are being developed with some aspects being put in place at present. Aquatic biomonitoring will function as an indicator of the effectiveness of the erosion and wetland protection measure. Any wetland loss caused by an action alternative can be effectively mitigated through a combination of the methods describe in Section 3.4.5.5. Decisions can then be made based on quantitative data to adjust management plans and mitigation procedures. An agreed upon, functional definition of biodiversity has been developed from which to base decisions on changes in management plans or mitigation techniques to achieve the desired goals regarding biodiversity.

3.4.6.2 Long-term Monitoring Plans

With all of the mitigation procedures integrated under the Integrated Training Area Management (ITAM) program the MS Army National Guard (MSARNG) has committed to fully funding not only implementation but monitoring of the procedures, long term, and making appropriate changes in management and mitigation procedures based on the most recent and quantified data. The ITAM implementation plan for National Guard (Appendix G) indicates that Camp Shelby has committed $380,000, $1,122,000, $1,053,000, and $1,160,000 for FY 1994-1997 respectively. This is in addition to the approximately $1,400,000 already expended for initial installation of the program. Camp Shelby's implementation/ operation plan will be updated on a yearly basis to reflect outyears and any needed changes.

3.4.6.2.1 Aquatic Monitoring

A monitoring program for aquatic systems within the boundaries at Camp Shelby is outlined in Section 3.4.4.2. The basis of this program is the chemical analysis and monitoring of

water quality at approximately 47 stations at Camp Shelby (see Figure 3-66). This approach to aquatic monitoring was developed to meet specific objectives related to sediment transport and deposition associated with training activity and natural erosional processes. Although aquatic monitoring based on water chemistry is widely accepted and practiced, these programsare often narrowly designed and limited in scope. Furthermore, assessments of the condition of aquatic systems based on chemical monitoring has several limitations. First, water quality fluctuates greatly (daily, seasonal) and chemical based monitoring can miss obscure events that may impact aquatic communities. This variability can occur due to chance or may be a product of collection schedules that are often restricted by seasonal access to sites and the availability of those doing the field sampling. For example, if a particular pollution episode is associated with activities taking place outside standard business hours, the probability of detection is low. Second, aquatic monitoring based on water chemistry alone is often best suited for the identification and delineation of point source pollutants and their impacts.

Point source pollutants emanate from a particular site or location in the landscape (e.g., municipal and industrial discharges) and can be readily monitored via water chemistry. Nonpoint source pollutants (NPS) are distributed across entire landscapes and are "diffuse" in nature, coming from many sources that are often associated with a particular land use (e.g., agriculture, timbering, mining) and therefore are more difficult to assess and monitor. Chemical analysis of water quality is often used for the general characterization of aquatic systems affected by NPS pollutants, but the variable spatial and temporal nature of NPS pollutants limits the effectiveness of this approach for assessing aquatic ecosystem condition. Second, chemical analysis is often very expensive when many chemical species are monitored. Limited budgets often restrict sampling to only a few periods per year, thereby reducing the ability to accurately assess and monitor water quality. To overcome the limitations of a chemical based water quality monitoring program to assess aquatic ecosystems at Camp Shelby an aquatic biomonitoring program is proposed. The biomonitoring program will not replace, but augment, the existing water quality program providing an integrated aquatic monitoring strategy. The integration of the programs will enhance the assessment and monitoring of Camp Shelby's aquatic systems and lead to superior management.

Aquatic Biomonitoring: Biomonitoring is best defined as the systematic use of biological responses of species, populations, communities and the function of communities to evaluate changes in the environment (Matthews [1982] as cited by Rosenberg and Resh, 1993). This entails the use of aquatic organisms (benthic macroinvertebrates, fishes, mussels) as continuous indicators and monitors of environmental health. Biomonitoring offers advantages over monitoring water chemistry alone because many of the organisms used (especially benthic macroinvertebrates): 1) are ubiquitous and therefore can be affected by environmental stressors in many aquatic systems and habitats, 2) represent large numbers of species with different responses to perturbations, 3) are sedentary in nature (some exceptions) which allows for the use of many species and trophic groups for spatial analyses of the effects of pollution or disturbance, and 4) the long life cycles of many of these organisms facilitate temporal analyses of pollution or disturbance. The unique monitoring attributes of selected

aquatic organisms can be applied to specific questions regarding aquatic ecosystem integrity or, when used in combination, act as continuous monitors of the various aquatic environments they inhabit. Therefore, biomonitoring can be designed for specific applications or used to characterize and identify perturbations associated with variable discharge, pollutant concentration, multiple pollutants, acute and chronic exposure, and synergistic and antagonistic effects (Rosenberg and Resh, 1993). In addition, biomonitoring has also developed to the point where many procedures are standardized, qualitative sampling and sample analysis is relatively simple and inexpensive, taxonomy of the major groups utilized is well known, responses to pollutants for many groups is already established, and analytical methods for data analysis currently exist.

Surveillance and Compliance Biomonitoring: Environmental modifications are often the product of natural disturbances in ecosystems (climatic, fire, disease), the result of changes brought about by human activities (development, timbering, agriculture), or, most commonly, a combination of both. Biomonitoring can function as both a surveillance and compliance tool in environmental assessment and management. Although aquatic biomonitoring is often coupled with chemical analysis and monitoring of aquatic systems, it need not be limited to situations where chemical approaches are present.

Surveillance is the most common type of aquatic biomonitoring. This approach typically includes aquatic surveys before and after a project is completed or follows toxic spills to track recovery. Surveillance is also used to determine if mitigation measures, water resources management techniques, or conservation initiatives are successful. In addition, surveillance biomonitoring can also be used to predict environmental impact prior to the start of a project. Historical biomonitoring, (long-term surveillance monitoring) is another application of biomonitoring which can establish environmental baselines, provide information regarding long-term trends in environmental quality, and identify emerging environmental problems.

The second form of aquatic biomonitoring, compliance biomonitoring, is done to ensure compliance with statutory requirements or to ensure that the requirements set forth in agreements to mitigate environmental impacts are maintained during and after construction of a project (Rosenberg and Resh, 1993). Compliance programs can also be extended over long periods to ensure receiving water standards and control long-term water quality.

Biomonitoring Program Objectives: There are several objectives inherent in the forthcoming Camp Shelby aquatic biomonitoring plan. These include components of both surveillance and compliance biomonitoring approaches. Objectives include, but are not limited to: general characterization of aquatic communities and their status (condition) at Camp Shelby, comparison of aquatic communities at Camp Shelby and reference sites (unimpacted areas), identification and monitoring of sensitive (indicator), threatened, or endangered aquatic species, establishment of a long-term aquatic data base, assessing and monitoring impacted areas due to ongoing or proposed training activities or other uses (timbering), success of mitigation techniques and programs associated with training activities, demonstrate compliance with U.S. Forest Service Special Use Permit (SUP) agreements (short-term compliance), and long-term trend analysis (long-term compliance).

Table 3-45 Environmental Monitoring Plan

Environmental Topic to be Monitored		DATA		SAMPLE		Frequency of collection	Frequency of Reporting	Responsible Party	Basis for Action	Action Required
		Requirement	Method	Size	Location					
Noise	Complaints	# and type	Data log	Total record	Range Control	Maintain Daily log	Annual Report	CS Range Control	25% increase over 5 yr avg	Develop procedures
	ICUZ Planning	LDN and LEQ	Monitor	24 hr days	Selected sites	In 94 AT period	As received	AG, ENV, AEHA	AR 200-1	Develop plan
T E & S Species	RCW	Check of Colony Sites	Visual Check	100%	Permit Wide	Bi-annually	Annual Report	FS	Presence of Individuals	Informal Consultation with USFWS
	Gopher Tortoise colonies	Vehicle Incursion of Colony Sites	Visual	100%	Permit Wide	Annual after AT	Annual Report	ENV. FS	10% of Colonies with Evidence of Vehicle Usage	Fence Affected Colonies
	Gopher tortoise semi-isolates	Burrow Damage	Visual	100%	Track Vehicle Area	Annual After AT	Annual Report	ENV,FS	10% of Burrows Show Damage	Create 200 foot Buffer
		Connecting Habitat Link Incursion	Visual	100%	Track Vehicle Area	Annual After AT	Annual Report	ENV, FS	20% of Habitat Links with Unauthorized Incursions	Fence Vehicle Travel Routes in Problem Areas
	Tortoise priority soils	Tracked Vehicle Usage	Visual	100%	Track Vehicle Area	Annual After AT	Annual Report	ENV,FS	10% of Sites with Incursions	Fence Affected Sites
	Sensitive Plant Species	Status	Visual	100%	Permit Wide	Annual After AT	Annual Report	ENV (LCTA), FS	Loss of Individuals Due to Military Activity	Create Buffer Around Affected Site
Biodiversity	Neotropical migrants	Number of Species	Visual, Audio	100%	Dr. Moore Plots	Annual	Bi-annual Report	ENV, FS	Declining Trend Over Four Years	Determine Probable Cause and Mitigate
	Snag density	Number Per Acre	Visual	10%	Within 1/4 Mile of Cleared /Thinned Area	Tri-annual	Tri-annual	FS	<Less Than 2 Per Acre	Create >Than 2 Per Acre
Wildlife	Deer	Population Estimate	DWFP Survey		Gross Track Vehicle Area	Bi-annual	Five Year Report	ENV, DWFP	Declining Trend After Five Years	Determine Probable Cause and Mitigate
	Turkey	Population Estimate	DWFP Survey		Gross Track Vehicle Area	Bi-annual	Five Year Report	ENV, DWFP	Declining Trend After Five Years	Determine Probable Cause and Mitigate
	Quail	Population Estimate	Visual, aural		Gross Track Vehicle Area	Bi-annual	Bi-annual	USFS, South MS Birdhunters Assoc	Declining Trend After Five Years	Determine Probable Cause and Mitigate
	Nongame birds	Status	Visual, aural	100% of LCTA plots	Permit wide	Annual	Bi-annual	ENV (LCTA), FS	Declining Trend in 25% of Species After Five Years	Determine Probable Cause and Mitigate
Streams	Water quality	Chemical	Grab, composite	protocol	monitoring stations	semi-monthly	annual	ENV	Significant changes in water quality	Determine Probable Cause and Mitigate
	Biomonitoring	Macro-invertebrates and fish	Species and composition	protocol	monitoring stations	quarterly	annual	ENV	Change in presence and abundance	Determine Probable Cause and Mitigate
Wetlands	Nutrient Levels	pH, N, P, K in soils	chemical analysis	5 pooled samples from at-risk sites	5 high-risk sites	annual	annual	FS, ENV	10% change from before-action condition	Modify fertilizer regime

Table 3-45 Environmental Monitoring Plan

Environmental Topic to be Monitored		DATA		SAMPLE		Frequency of collection	Frequency of Reporting	Responsible Party	Basis for Action	Action Required
		Requirement	Method	Size	Location					
	Species composition	Community frequency	observation	Permanent plots	5 high-risk sites	annual	annual	ENV (LCTA), FS	Change in species composition	Determine Probable Cause and Mitigate
	Intrusion	Number of events	Visual	100% survey	at-risk sites permit-wide	annual, after AT	annual	ENV, FS	10% of marked areas with serious incursion	Determine Probable Cause and Mitigate
	Losses	acres damaged or lost	survey	100% survey	all sites. permit-wide	1) site planning 2) following construction	as site is developed	ENV	Is loss within 10% of area projected in Final EIS?	Implement or add to mitigation
Soil Loss	Rehab Program	acreage requiring rehab	visual	100% survey	permit-wide	annual	annual	ENV, FS	< 90% of need complete by 1 Dec for 2 years	Reduce training load or add funds
	Volume of losses	tons/ac/year	silt traps	selected sites	at-risk maneuver areas	1) Before AT 2) After AT 3) After rehab	Bi-annual	ENV, FS	Average losses <110% of predicted	1) improve rehab 2) add structures
	Catchments	volume collected	probe and compute	all catchments	permit-wide	annual	annual	ENV, FS	Attain 50% of capacity	1) clean out 2) add structures
Timber Harvest		Harvest Schedule	Planned vs. actual	100%	Ranger District	Annual	Bi-annual	FS	25% Variation from 1991 Levels OR USFS plan levels	Adjust to match average OR modify plan
Vegetation		Species and composition	survey	100% of LCTA plots	Permit wide	annual	annual	ENV (LCTA)	Change in composition	Determine Probable Cause and Mitigate
Wildfires		# military caused	fire reports	100%	permit-wide	annual	tri-annual	FS	10% increase over 5 yr average	Modify pre-suppression activity
Road Closures	Artillery Use	Highway 29 closure	Number and duration	100%	events	annual	bi-annual	Range Control	20% increase over 3-yr average	Analyze cause and modify training
	Convoy crossings	Interruptions	Number and duration	100%	Hwy 29. FS 303. FS 385	annual	bi-annual	Range Control	20% increase over 3-yr average	Analyze cause and modify training
Decision Matrix		Number of uses at CSTS	Enumerate	All uses	Permit wide	annual	Five-year report	DPTM, ENV, FS	> 10 issues raised to Site Supervisor and/or District Ranger	1) Evaluate usefulness 2) Modify matrix

Definitions of the abbreviations and conventions used in Table 3-45 are as follows:

ICUZ - Installation Compatible Use Zone
RCW - Red-cockaded Woodpecker
LDN - Weighted day-night noise level
AT - The (summer) Annual Training periods
CS - Camp Shelby
AG - The Mississippi Adjutant General
ENV - The Camp Shelby Environmental Management Office
FS - U.S. Forest Service
AEHA - U.S. Army Environmental Hygeine Agency
LCTA - Land Condition-Trend Analysis
DWFP - (Mississippi) Dept. of Wildlife, Fisheries and Parks
USFS - U.S. Forest Service
CSTS - Camp Shelby Training Site
TE&S - Threatened, Endangered, and Sensitive Species

To achieve these objectives a biomonitoring plan is needed to identify representative organisms and/or communities that will be used as biomonitors (focus will be on macroinvertebrates and fishes), develop a sampling network that includes reference sites (specific to that ecoregion) and other sampling locations with various degrees of impact (real or anticipated) or of particular interest, a standardized sampling protocol, a sampling regime that reflects seasonal conditions and usage patterns at Camp Shelby, and adhere to scientifically based and currently accepted methods and practices.

Preliminary Aquatic Biomonitoring Plan: Biomonitoring stations will be located throughout the installation. The sites will be allocated relative to stream order, habitat type, proximity to ongoing or proposed military activities, known locations of sensitive or indicator species, site accessibility, and other criteria. Reference sites will be located in areas having the most natural, least impaired ecological condition for the ecoregion. The Whiskey Creek and Green Creek drainages have been identified as possible reference areas. On-site investigations and consultations with local ecologists, universities, and agencies will aid in the location of additional areas.

Macroinvertebrates and fishes will be the featured taxonomic groups monitored following current scientific preference for their use as biological monitors (Hellawell, 1986). Sampling will occur concurrently and reflect seasonal variation in climate and land use activities. Standard methods for sampling, data processing, and analysis will be followed.

3.4.6.2.2 Monitoring Plan

In addition to the aquatic monitoring discussed in Section 3.4.6.2.1, many other elements of the Camp Shelby environment are, or will be monitored. Table 3-45 presents the basic monitoring plan for Camp Shelby. Listed here are the topics to be monitored, how the data are proposed to be collected, how and when samples are to be taken, the frequency with which reports are to be prepared, the organization(s) responsible for acquiring data and preparing reports, one or two basic criteria for evaluation of the results, and a preliminary statement of remedial actions to be taken if and when one or more of the action criteria are exceeded. All elements as stated in Table 3-45 are preliminary, and may require revision as actual environmental effects become evident. In that case, topics may be added as required, data collection made more or less frequent, responsible parties redesignated, and action criteria revised to better meet current requirements.

Broadly speaking, the monitoring proposed corresponds to those places in the Final EIS where the National Guard has proposed to manage, maintain, or protect some environmental element. Several elements, e.g., vehicle incursions into gopher tortoise colonies, are simplistic in concept, and are not proposed to require elaborate equipment to observe and measure. Others, such as the noise monitoring, require skilled, professional operators utilizing extremely specialized equipment to acquire accurate data. In the former case, complete surveys using local resources are reasonable to suggest. Where complex measurement equipment is necessary, the interval between sampling is greater.

Many elements are suggested to be measured or inspected following the annual training period, i.e., at the end of the summer. This is at the time when the highest intensity of use has just passed, and the likelihood of damage or incursion into sensitive areas was also the highest. Thus, monitoring or inspection at this time for many elements simultaneously should be efficient in terms of results as related to time expended.

Monitoring will be accomplished for training areas based upon their issue to units for training. Upon completion of training, the area used will be inspected to insure compliance by using units and to monitor for any recovery action necessary. Both Camp Shelby staff and U.S. Forest Service staff will be involved in the monitoring process. Table 3-45 is the desired standard. Resource constraints may result in some reduction in scope and frequency, i.e., 100 percent gopher tortoise colony annual inspection.

3.4.7 Historic and Cultural Resource Protection

To satisfy U.S. Forest Service permit requirements, prior to any new site-disturbing construction or activity on National Forest lands at Camp Shelby by the Army National Guard, an archeological survey will be conducted. If archeological sites are located by such surveys they will be evaluated for eligibility to the National Register of Historic Places in accordance with state and federal regulations and guidelines. The treatment of human remains encountered on Camp Shelby will be guided by the National Forest's human remains policy and the Native American Graves and Repatriation Act (PL 101-601). See Appendix A, Part 2, Clause 47 of the proposed Special Use Permit.

Any sites determined eligible for the National Register will either be avoided and preserved or mitigated through archeological excavation. All final determinations concerning newly discovered archeological resources on National Forest lands will be made jointly by the Mississippi State Historic Preservation Officer, the U.S. Forest Service and the Army National Guard.

3.4.8 Implementing Forest Modifications

The Proposed Training Area development plans, including those for timber thinning and clearing and for special accommodation of threatened, endangered and sensitive (TE&S) species, as discussed in Section 3.3.1.3, and displayed in Figures 3-22 through 3-24 and 3-29, are conceptual in nature. The processes of surveying, marking and modifying the newly developed training areas will require a minimum of four years to complete. Detailed site engineering has not taken place prior to selection of an alternative to be implemented. As described in Section 1.4, planning and design will be required prior to the on-the-ground implementation of any of the Alternatives 1, 2, 3A or 3B. It is anticipated that new data will become available and that changes in location of mobile species, such as the Gopher Tortoise, are likely.

During the implementation phase of the process, all available information on elements such as exact boundaries of wetlands and wetland soils, locations of sensitive species, placement of

required fencing and warning signs, measurement of buffers required around those sensitive species for which the biological opinions require a buffer, and other environmental criteria will be developed in a detailed manner through joint survey by Camp Shelby, U.S. Forest Service, U.S. Fish and Wildlife Service and State of Mississippi personnel.

Environmental constraint recommendations have been applied to training areas in the development of clearing and thinning plans (see Figures 3-22, 3-23, 3-24 and 3-29). The wetland areas are not planned to be used for tracked vehicle training. Also included in the no action zones are known gopher tortoise colonies, priority soils, and inactive red-cockaded woodpecker colonies. The corridors were modified to avoid priority soils to the greatest degree possible and pass through or near the buffer areas of sensitive species only on a narrow, well-defined, improved roadway. In most cases, this road is already cleared and in use for other purposes, so disturbance will be minimal.

In this manner, as more details of the exact locations of sensitive species become better known and boundaries are more exactly defined, each of the proposed training areas and corridors which is involved in the alternative finally selected will be "fine tuned" to meet environmental requirements. It is believed that such cooperative designation of those elements which must be avoided in final implementation is the central premise and the major mitigation process of the entire action. The effectiveness of the various mitigation measures will be continually monitored and modified as necessary to meet the intended result.

3.4.9 Forestry

The potential for impacts on the De Soto National Forest and private landowners through putting large volumes of unscheduled timber on the market are planned to be substantially mitigated through a four year program to remove no more than 16-20 MMBF annually. The Knutson-Vanderberg Act (KV) collection and other possible adverse effects on the Forest Service are proposed to be reduced by maintaining acceptable levels of a regulated program and substituting the military funding for the planting of returned tank maneuver areas. The long term impacts to timber production may be mitigated by the purchase of additional land for National Forest management or by intensifying timber management on currently regulated acres. Current trends in National Forest timber management and concern with the Federal Deficit indicate a low probability that mitigation for the long term impacts to timber production will be undertaken in the foreseeable future.

3.4.9.1 Fire

There are several mitigation measures which may be taken to reduce the impact to soils and wildlife from high intensity wildfires. They may be separated into the following categories:

Ranges and impact areas: Limit firing during periods of C+ fire danger and above or provide a helicopter with water drop capability on stand-by (see "Use of Decision Matrix," Section 3.4.3.1). Establish fire breaks/green strips within ranges and impact areas.

General permit area: As part of Integrated Training Area Management (ITAM), include wildfire prevention education as it pertains to military operations. Advise troop commanders when fire danger reaches C+. Advise troop commanders of appropriate actions to take, based on fire danger, in the event of a wildfire. Limit use of incendiary devices during periods of high fire danger, class D and above.

3.4.10 Biodiversity

Very little can be done to mitigate impacts to biodiversity from the creation of tank training areas. However, current tracked vehicle training areas will be turned back into the U.S. Forest Service (USFS) management base under Alternatives 1-3B, and 5-6. These turn back areas will result in minimizing impacts to biodiversity under Alternatives 3A and 3B by affecting a net decrease from the present tracked vehicle areas, and help compensate for more extensive negative impacts on biodiversity under Alternatives 1 and 2.

In an effort to protect unique and sensitive environments, the MSARNG proposes maintaining a 100-foot buffer around each identified wetland. This vegetative buffer will promote connectivity of communities, help protect habitat for some species, minimize sedimentation, maintain avenues of dispersal for others, and help minimize genetic isolation of populations. Islands of forest will not be intentionally created. Rather, remaining forested areas will be left as large as possible, linked to each other, or left adjacent to the riparian buffer zones or other wetland areas whenever possible to minimize fragmentation. The MSARNG also proposes not to run tracked vehicles over areas with slopes exceeding 10 percent. Avoiding these areas will reduce the potential for excessive soil erosion, disrupting or altering natural ecosystem processes.

While also a current mitigation tool, the Integrated Training Area Management (ITAM) program is proposed to be continued. One component of ITAM, the Land Condition-Trend Analysis program (LCTA), will also continue. Continued annual surveying of LCTA study plots will assist installation personnel in monitoring small mammal populations, neotropical migrants and other bird species visiting the installation. Avian predators and nest parasitizers, expected to increase under the action alternatives, can also be monitored via LCTA. Multiple years of pre-implementation (pre-treatment) LCTA data will be collected prior to the initiation of any construction or tracked vehicle activities. Impacts to vegetation and wildlife from implementation and proposed activities can then be more accurately quantified and monitored, and the effectiveness of proposed mitigation programs evaluated and adjusted if necessary.

3.4.11 Quality of Life

Effects of proposed alternatives will be mitigated in much the same way as those of present training activities that take place at Camp Shelby (Section 3.3.4). Regulations are in place for vehicle movements, Highway 29 closure, traffic control, training operations, dust abatement, smoke operations, pyrotechnics, and range control. National Guard and Forest Service personnel will develop a standard operating procedure (SOP) to address maneuver activities and public road conflicts. The contents of the SOP will be dependent upon the alternative selected.

In addition, ITAM program (Section 3.4.1) will provide installation personnel with the resources to make more informed land management decisions. The Environmental Awareness program will be used to educate officers and their troops of the need to maintain the natural resources in a condition that will allow them to train. Use of vegetative buffer strips will also help to keep vehicle traffic at a safe distance away from sensitive land use areas.

3.4.11.1 Weapons Noise

It was identified in Section 3.1.5.2 that the synergistic effect of both impulse noise resulting from tank and artillery fire into the impact area and the flight activities of the 2,000 to 2,800 Air Force and Air National Guard jet aircraft which use the impact area as well had caused potentially significant effects on the quality of life of those residents immediately south of the impact area. Upon examination of the interaction between weapons noise and aircraft noise, consideration has been given to which, if any, of the causes may be modified for the purpose of reducing this noise. For a variety of reasons, as discussed in part in Section 1.3.1, relocation of the impact area is impractical as a mitigation measure.

Reduction of the level of firing has been examined as a mitigation measure, and has also been determined to be impractical, with one exception. Present training schedules are already, for reasons of minimum levels required to maintain skills. When compared to the recent past, however, one significant decrease has been made. The M60A3 tank gunnery program, which was completed as of October 1991, represented a significant temporary *increase* in tank gunnery activity for more than 5 years. This increase roughly doubled the number of tank rounds fired in a year, when compared to regularly scheduled unit training plans. The decrease, by almost 50 percent, since 1991 may be viewed as a mitigation measure which will remain in effect indefinitely. The change to the 120mm main gun generates more noise than the 105mm round it replaces, the combat round is not used in training. There is a special training round for the 120mm main gun, and it generates slightly *less* noise than the 105mm ammunition. Thus, while not used primarily for noise reduction purposes, the training round is also a form of noise mitigation which will continue indefinitely.

3.4.11.2 Aircraft Noise

The synergistic effect of the impulse noise resulting from tank and artillery fire into the impact area and the flight activities of the 2,000+ Air Force and Air National Guard jet aircraft which use the impact area as well, had caused potentially significant effects on the quality of life of those residents immediately south of the impact area. The weapons firing related to the air-to-ground ranges is already included in the impulse noise calculations and contours. While examining noise-generating activities for aspects which could be changed to reduce effects on area residents, it was proposed in May 1993, that the flight tracks flown by the Air Guard high performance aircraft when using Range 202W could be relocated away from the area near Paret Tower. The typical flight circuit traditionally made by aircraft using the west range was a counter-clockwise square (see Figure 2-3B), with the targets at the northwest corner. Following discussions between the Army and the Air Force National Guard in June 1993, this circuit was proposed to be made *clockwise*, removing the return-to-target lanes from the Paret Tower vicinity. Recently established "no-fly" zones and Figure 3-19 for the revised flight paths, no-fly zones, and direction of operation, the tracts were "flattened" slightly, so that those noise levels which would be evaluated as unacceptable remained entirely within the permit area. This change has been in place since mid-June, 1993. Informal discussions in November 1993 with persons living and working in the previously affected area indicate that this change has been noticeable, and that some positive benefit has been realized.

3.4.12 Mineral Exploration and Extraction

As discussed in Section 3.3.4.2, there is some potential for development of proposed training areas and corridors to reduce access to underground mineral resources, including gas and oil. The rights to these minerals may be held either by the U.S. Government, which is the case with a majority of the National Forest lands, or by other parties. In the case of U.S. Government owned rights, leases will continue to contain the military use stipulations as shown in the sample lease, Appendix T. Alternate provisions for exploration and extraction (normally by drilling and pumping) can usually be made, including revised placement of equipment, scheduling of activity, and directional drilling, where feasible. Locations where the rights are held by private parties must be handled on a case by case basis, should they arise, with accommodations similar to those in the Bureau of Land Management lease. In cases of severe conflict with pre-existing structures and equipment, the routing of corridors and clearing of training areas will be re-drawn to avoid direct conflict with the drilling and pumping equipment, pipelines, storage tanks, and other fixtures.

Development of PTA 1 indicated a potential for conflict with an existing pipeline operated by Florida Gas Transmission. This routing was known before the PTA was planned, and the placement of hardened crossings was proposed for four places where maneuver corridors were to cross the route. The design of the crossings and their exact placement will depend on the depth of burial of the pipeline and soil conditions at the specific location, and will be another aspect of the detailed site analysis discussed in Section 1.4.

3.5 Cumulative Effects on Environment

3.5.1 Vegetation

To fairly assess cumulative effects of the past, present and proposed actions it must be realized that large expanses of the long-leaf pine ecosystem, including Camp Shelby were once owned by private timber companies. These areas were clear cut prior to the development of Camp Shelby. Therefore, we are assessing cumulative effects based on existing conditions which reflect Forest Service management of second growth forest rather than management of a pristine or an undisturbed long-leaf pine ecosystem.

The cumulative effects of the past and present use and the proposed action at Camp Shelby will at times be measurable but with a few exceptions not significant (see Section 3.6). Full implementation of the ITAM program will allow Camp Shelby environmental personnel to maintain and protect all wetland vegetation and TE&S species habitat and rehabilitate maneuver areas with adequate vegetative cover to maintain water quality and the integrity of the soils. One hundred years from now the tracked vehicle and tank maneuver areas could be returned to the Forest Service and the areas could be incorporated back into their management scheme with standard Forest Service replanting action. The impact area would still be considered contaminated and not available for normal management. The land occupied by certain buildings and other facilities would be unsuitable for forest management, however, these areas are relatively small.

3.5.2 Soils

Following the same logic as with vegetation, the cumulative effects of Camp Shelby activities on soils, with a few exceptions, will be minor because the Erosion Control Plan will be followed and the ITAM program has been implemented. The areas of greatest concern will be the tracked vehicle and tank maneuver areas. The full implementation of the ITAM program and use of the training Decision matrix will limit the adverse effects of training. Controlling the type of training done, rehabilitation and revegetation efforts will maintain the soil resource to a degree that the land could be incorporated back into forest management in the future with little more than normal replanting effort.

3.5.2.1 Impact of Training Activities On Wet Soils

Army training activities, especially the employment of wheeled/tracked vehicles during wet periods, pose the following two impacts to Camp Shelby soils.

- Destruction of vegetation and soil structure and the subsequent soil erosion. This leads to sediment delivery to downstream wetlands and surface waters.

- Soil compaction. This results in an increase in soil bulk density and a reduction in soil porosity caused by external forces.

Because of the extremely important nature of the problem, the potential impacts and associated mitigation measures of training activities on wet soils are described in the following sections.

3.5.2.1.1 Sediment Generation

The second impact from wheel- and track-type vehicular traffic on wet soils is excessive loss of vegetation, puddled soils, reduced infiltration and drainage, and sediment delivery to surface waters and downstream wetlands. The obvious preventive measure is to avoid both heavy wheel- and track-type traffic on soils that are near their plastic limit (see Section 3.5.2.2). Training can be continued on sandy areas, if available. This is because sandy soils are not as susceptible to compaction or soil puddling as are the loam and clay soils.

3.5.2.1.2 Compaction

Concern about soil compaction is justified because of the heavy loads of the wheel- and track-type vehicles that are used on training lands, especially when such activities take place when the soils are wet and can be easily compacted.

Compaction refers to the increase in soil density as a result of applied loads or pressure. Compaction increases progressively with the water content to a maximum and then decreases with further addition of water. This maximum occurs at approximately 80 percent of saturation and is known as the optimum water content for compaction. While traffic on soils with moisture above maximum compaction levels will not result in additional compaction, soil structure will be severely damaged and surface sealing will occur. Water infiltration will be limited until this seal is removed by tillage or by natural processes such as freeze/thaw or drying/wetting.

For a given soil, the increase in soil compaction due to vehicular traffic will be least when the soil is dry and greatest when the moisture content is near field capacity. Therefore, training activities should be scheduled, as and when possible, under dry soil moisture conditions (see Section 3.5.2.2).

Soil compaction results from horizontal forces caused by thrust, as well as from vertical forces produced by loading (Gill and Reaves, 1956). Tracked vehicles produce vibrating stresses that make the total stress considerably higher than the average for the same ground pressure. Detrimental effects of vehicles are greater when the soil is at moisture content near field capacity. Peak compaction occurs at moisture content near the plastic limit, which is about the optimum condition for tillage operations.

The effect of soil compaction on plant development has been the objective of numerous studies. However, the effects of soil compaction from wheel- and track-type vehicles are not yet well understood. Trouse (1971) stated that a plant can respond normally as long as all of its nutrient needs are satisfied. According to Trouse, soil density (which is an indicator of

compaction) is not a plant need. If adequate soil moisture supplies are available, there is little difference in plant growth due to compaction.

Sohne (1958) and Taylor (1982) showed that the compaction in the upper soil layers is determined by the tire contact pressure while the compaction in the subsoil is a function of total load of the vehicle. Erbach et al., (1986) reported that the yield of plants growing in tracks of a track-type tractor was 5 percent greater than the yield of plants growing in the track of a wheel-type tractor with higher soil pressure. The work of Erbach et al., shows little resultant difference between wheel-type and track-type compaction. On the other hand, Wittsell and Hobbs (1965), Gaultney et al., (1982), Gameda et al., (1985), and Schuler and Lowery (1984, 1986) obtained reduced yields which resulted from higher machine loads and thus increased soil compaction.

Compaction hazard depends on soil type and moisture. Sandy soils are not as susceptible to compaction. Clay and loamy soils can be seriously compacted when soil moisture exceeds their plastic limit. Heavy equipment should not be allowed on loamy or clay soils when the water table is within 12 inches of the surface or when the soil moisture exceeds the plastic limit.

Compaction hazard also depends on ground cover and number of machine passes. Most of the compaction occurs during the first three passes and little additional compaction occurs after 10 passes (Burger et al., 1985; Hatchell et al., 1970; Kreh et al., 1985; Moehring and Rawls, 1970; and Simmons and Ezell, 1983).

Soil compaction has the potential to: 1) decrease the infiltration rate, increase runoff, and decrease water storage, 2) increase the water content above a compacted surface layer by slowing the internal drainage of water, 3) decrease root growth. Compaction caused by heavy machinery on wet soils can extend to 24 inches and below. Since this is well below the depth of normal tillage, and even subsoiling, compaction is more likely to persist for several years.

The most common implement used with the intent of destroying tillage pans and reducing subsoil compaction is the subsoiler. However, it has been reported that sometimes subsoiling to 16 inches did not increase yields. This and other research results lead to the conclusion that benefits from subsoiling are variable and relatively small in the Midwest (Swan et al., 1987).

Data collected as part of Integrated Training Area Management (ITAM) monitoring at Camp Shelby seem to indicate that heavy-use sites have a higher dry density than control sites. While this fits expected trends, the scatter in the data and variability between soils do not allow definitive conclusions to be drawn. Additional data collection is appropriate to assist in remediation procedures and frequency.

3.5.2.2 Use of Training Decision Matrix

A decision matrix, represented by the flowchart in Figure 3-62, was developed to assist in conducting appropriate training while maintaining the integrity of the soils in the training areas. Each decision point in the flowchart requires information to make informed choices that affect the available training activities and areas and affect subsequent environmental maintenance.

The first decision to be made in the flowchart is whether soil conditions are "dry", "normal", or "wet". Specific, objective information is not yet available for this decision, but subjective evaluations have been made in the past. These decisions will continue to be made, but specific data is proposed to be collected to ascertain the soil moisture conditions that cause the "dry" or "wet" decisions to be made. Critical soils for the "wet" decision include Susquehanna and other fine-textured, poorly drained soils.

A "dry" decision causes dust and fire hazards to be monitored more closely and control measures to be implemented as needed. The fire hazard will be evaluated as actual USFS fire hazard. If the fire hazard is greater than C+, a helicopter with a water bucket will be readied for use as necessary.

A "wet" decision causes training to be limited and leads to a subsequent decision on "very wet" soil conditions that, if they are deemed to exist, leads to more restrictions on training, including a limitation on tracked vehicle movement. Alternative training activities are and will be developed to allow productive use of Camp Shelby facilities without damaging its soil resources.

Regardless of all the decisions within the flowchart, temporary erosion controls will be implemented as needed and permanent controls will be monitored for necessary emergency repairs. Critical areas are monitored and rehabilitated as soon as possible if damaged. After the last annual training period, all areas begin their annual rehabilitation as needed, with weekend training continuing on non-rehabilitated areas as available.

3.5.3 Wetlands and Water Quality

There will be small losses of wetlands because of new wetland crossings under Alternatives 1 through 4. The loss of these mostly scattered small areas within the proposed training areas (PTAs) is not believed to have a significant adverse ecological impact because they are widely separated, and in no case represent major parts of a single biological system. Neither is there expected to be a cumulative negative effect on wetland quality as a result of proposed Camp Shelby use. Wetlands and the associated buffers will be off limits to training or disturbance except at designated crossings designed to protect the integrity of the wetland. The longest crossings may be bridged, rather than crossed with an at-grade roadway. The determination of the required crossing type will be made as one aspect of the detailed site analysis (see Section 1.4), and will be a part of the permit application for that crossing. All proposed construction and operation of facilities and maneuver areas will be completed under

Table 3-46 Changes to Pine Forest Management Base: De Soto National Forest

Alternative	Changes in Net Acres National Forest Management (Acres)	Camp Shelby Permit Area		Black Creek Ranger District		De Soto National Forest	
		Pine Acres	Percent Change	Pine Acres	Percent Change	Pine Acres	Percent Change
1	- 7,343	67,587	- 10.9	148,666	- 4.9	361,281	- 2.3
2	- 4,475	67,587	- 6.6	148,666	- 3.0	361,281	- 1.7
3A	+ 5,562	67,587	+ 8.2	148,666	+ 3.7	361,281	+ 1.4
3B	- 433	67,587	- 0.6	148,166	+ 0.3	361,281	+ 0.0
4	-0-	67,587	-0-	148,166	-0-	361,281	-0-
5	+ 14,651	67,587	+ 21.7	148,166	+ 9.9	361,281	+ 3.7
6	+ 21,787	67,587	+ 32.2	148,166	+14.7	361,281	+ 5.6

Table 3-47 Pine Forest Land Acreage Change: Five-County Economic Area

Alternative	Changes in Pine Net Acres National Forest Management	Acres of Managed Pine Forests					Percent Change
		National Forest	Other Public	Forest Industry	Private Lands	Total Timberland	
1	- 7,343	147,300	13,700	239,500	247,100	647,600	-1.1
2	- 4,475	147,300	13,700	239,500	247,100	647,600	-0.7
3A	+ 5,562	147,300	13,700	239,500	247,100	647,600	+0.9
3B	- 433	147,300	13,700	239,500	247,100	647,600	0.0
4	-0-	147,300	13,700	239,500	247,100	647,600	-0-
5	+ 14,651	147,300	13,700	239,500	247,100	647,600	+2.3
6	+ 21,787	147,300	13,700	239,500	247,100	647,600	+3.4

guidelines set by the Erosion Control Plan and the Integrated Training Area Management (ITAM) Program. These efforts will maintain the water quality and integrity of the wetland areas relative to current conditions.

3.5.3.1 Surface Water

Current activities and current uses of surface waters at Camp Shelby are known to have a minor effect on the quality of surface waters. Although changes in stream discharge may occur (see Section 3.3.1.5), it is projected that future army training activities will have no significant cumulative adverse effects under normal circumstances. Monitoring to keep track of current conditions is a portion of the ITAM prescription.

3.5.3.2 Nutrient Flow

Through new analytical tools, and subsequent to the question being raised during the public comment period following availability of the Draft EIS, a tentative determination has been made that the potential does exist for unacceptable levels of loss of fertilizer to the ecosystem, especially to wetland areas. The suggested solution to this potential problem is to reduce the amount of fertilizer applied at any one time by about 50 percent. A split application, with half applied at planting time, at Camp Shelby, this is usually late summer to fall, and half in the early spring, should maximize uptake by the newly-planted groundcover and minimize losses by leaching.

3.5.4 Forestry

Cumulative effects to forestry and forest industry are negative for Alternatives 1 and 2 when compared to Alternative 4, but vary in intensity among the alternatives. Short term effects, up to about twenty years, are positive for all alternatives as additional timber is brought to market from returned tank areas and project implementation. Mitigation actions described in Section 3.4.7 will reduce some but not all of the effects. Alternatives 3A, 5, and 6 have positive effects for forestry and forest industry as lands are added, in varying amounts (Tables 3-24, 3-45, and 3-46), to the managed forest base. The turn-back acres are stocked to varying degrees with a variety of age classes (see Appendix O). Longer term beneficial effects will occur as de-forested acres are planted and return to timber production.

Removal of large acreage from the managed timber base may result in the effects discussed in Section 3.1.4.3. Site specific analysis prior to implementation may result in some no action areas receiving treatment or being withdrawn from timber management for other resource considerations. Thus, Tables 3-45 and 3-46 probably represent the least amount of acreage which may reasonably be expected to be withdrawn from the regulated timber base. The primary cumulative effects to local independent harvest contractors are increased cost of operation due to the lengthened haul and operational distances and increased competition while those to purchasers of local timber are increased costs as the result of increased competition for a shrinking resource.

Current trends in National Forest management show an increasing de-emphasis on timber harvest and production. This trend is expected to continue with the current revision of the National Forests in Mississippi's Land and Resource Management Plan (LRMP) and into the foreseeable future. Examples of this are the removal of acreage from the managed timber base for other resource emphasis and less intensive timber management of the remaining regulated timber lands which then produce less per acre volume. The total effect of this de-emphasis can be quite significant and the total cumulative long term effects of removing additional land from the managed timber base may be more severe than appears. However, reduced timber sale volumes due to a reduction in the managed timber land base may be offset by the increasing volumes from previously harvested and re-planted stands coming into full production. Thus future timber volumes may not be appreciably reduced below the levels marketed today.

Implementation of Alternatives 1, 2, 3A, or 3B could reduce the number of seedlings needed for regeneration of forested acreage. The reduction in seedling demand which could occur as a result of this implementation would be less than 1 percent of the total 1991 nursery production at the U.S. Forest Service Ashe Nursery. The Forest Service policy of emphasizing natural regeneration rather than planting has far more effect on seedling production and reforestation related jobs than the implementation of any of the alternatives.

3.5.4.1 Impact Of Timber Clearing On Water Yield In Forested Watersheds

The impact of timber clearing on water yields can best be projected following a research study by Kochenderfer et al., (1990). Studies to determine the effects of various cutting practices on the quantity, quality and timing of streamflow were considered in seven watersheds of the study area. Watershed treatments included individual tree selection, commercial clearing, clearcutting upper and lower halves of watersheds, clearcutting all trees greater than 1-inch diameter breast height (dbh), and maintaining clearcut watersheds barren with herbicides for several years. Kochenderfer et al. found that water yield delivery was directly related to the percent of vegetation removed. Yield increases were greatest during the growing season. They further observed that light selection cutting had only a minimal effect on seasonal water yields. The primary effects of the increased water yields are related to increased soil erosion in the cleared areas. These include potential siltation of wetlands, decreased surface water quality and depletion of soil resources. As discussed in Sections 3.4.3 and 3.4.5, proper mitigation procedures will serve to reestablish ground cover and minimize soil erosion in cleared areas thereby minimizing the cumulative effects of timber clearing.

Increased water yield, especially under Alternatives 1 and 2, will result in some long term modification of lotic ecosystems. Even with mitigation efforts that can dramatically reduce nonpoint source pollution movement to streams, some negative impacts will occur. The export of nitrogen, phosphorus, and sediment from terrestrial sources to aquatic systems will occur over the long term although levels should not be excessive if Land Rehabilitation and Maintenance (LRAM) programs are properly designed and implemented.

3.5.4.2 Range Wildfire and Prescribed Burning

The principal cumulative effects of fire are air quality related. Camp Shelby range fires may occur or burn into the night due to necessary modified suppression actions within the Impact Area and buffer zone. This type of fire, when in combination with other wildfires and prescribed burns, may cause smoke dispersion problems and resultant intrusion into the smoke sensitive zones along Highways 49 and 98.

The cumulative effects to soils, vegetation, and wildlife of additional wildfires occurring on the new proposed MPRC-H range can be mitigated to some extent if the recommendations in Section 3.4.9.1 are followed. They can not, however, be eliminated as some areas will burn on an annual basis adding to the area of land which has no humus layer nor organic matter.

3.5.4.3 Effects of Timber Removal on Climate and Global Warming

Forests and vegetation both affect and are affected by the climate (Davis and Zabinski, 1992; National Academy of Sciences, 1991; S.H. Smith, 1992). Green plants, including economically important forest species, conduct photosynthesis, which, in sunlight, involves the conversion of water and carbon dioxide to plant material and oxygen. In the dark, plants act more as animals, including humans, and use oxygen and give off carbon dioxide. Plants also store carbon in their cell walls in the form of cellulose and other compounds. The proposed action has the potential to affect these processes in two ways. First, if the areas cleared and thinned were to be left bare year around, or paved, or otherwise sterilized, the photosynthetic process could not take place in the several thousand acres involved. Since revegetation with grasses and legumes will take place in all areas, with renewal every year where necessary, green, vigorously growing plants will still cover the majority of the areas for a majority of the year. The average photosynthetic efficiency of the revegetation species is much higher than that of coniferous trees, so little or no loss may be expected in oxygen production.

The issue of storage of carbon within the plant tissues is more complex. Forests do store more carbon for longer periods than do grasses and legumes. Since this stored carbon is not available to be added to those greenhouse gasses already present in the atmosphere, a potential is seen by scientists for forests to reduce the rate of global warming (Houghton et al, 1993; Heath et al, 1993; Dixon et al, 1993). Within the limits of capability to measure such factors, the several thousand acres which might be cleared or thinned would represent a small (much less than one percent) reduction in the total stored carbon of the multi-state region. Comparative data are not available for the area which will be lost, across the region, by clearing for subdivisions, building sites, parking lots, and other, similar losses over the five year period planned for clearing, but the contribution from the proposed actions must be a very small proportion. The change in carbon storage, and potential increase in atmospheric carbon dioxide, is not believed to be locally or regionally significant.

3.5.5 Wildlife

Military impacts to wildlife over the past thirty-five years cannot be accurately quantified, as few studies had been done on the lands prior to the formation of Camp Shelby. Based on LCTA studies (Appendix Q) and on observations by other researchers and civilians, the terrestrial and aquatic fauna present on Camp Shelby are representative of the region. Training activities have undoubtedly impacted wildlife species differentially. Each of the action alternatives will favor those species utilizing edge habitats, some of which provide important recreational opportunities to the hunting public. However, interior species, including neo-tropical migrants, requiring larger contiguous stands will not benefit from the proposed timber removal plan. The return of tracked vehicle areas to non-tracked vehicle areas will help minimize net negative cumulative effects.

Long-term benefits to wildlife are expected to some degree with Alternatives 5 and 6. Most of these impacts to wildlife from Alternatives 1-5 will clearly alter species composition,

abundance, and distribution within affected areas (Goran et al., 1983), but so do many widely accepted timber management practices (Tevis, 1956) utilized by the U.S. Forest Service and private industry.

3.5.6 Threatened and Endangered Species

In spite of habitat improvements and protective measures, the population of red-cockaded woodpeckers in the southeast region, including Camp Shelby, has continued to decline. Schnell and Chapman (1991) (see Appendix N) found no evidence that red-cockaded woodpeckers were currently using any of the lands on Camp Shelby. Suitable habitat exists and previously used colony sites continue to receive protection. With the Alternatives 1 and 2, a substantial amount of timber will be removed. While this may represent a decrease in potential red-cockaded woodpecker habitat in some areas, the great majority of timber on Camp Shelby will remain to provide potential foraging and nesting sites to the woodpecker.

Camp Shelby continues to support a fairly wide-spread gopher tortoise population. Whether or not management actions (e.g., establishing the gopher tortoise refuge) have stabilized or enhanced the population is not known at this time. It is believed, however, that the military has afforded the gopher tortoise at least a small degree of protection through the closure of areas from public entry. As human depredation and vehicular traffic mortality have been determined to be a major contributing factor in the gopher tortoise decline (Wester and Swing, 1990), this limited protection may be significant in the long run.

The eastern indigo snake has been reported to occur on Camp Shelby, but the paucity of confirmed records suggests it is extremely rare. This species has a commensal relationship with the gopher tortoise and will most likely benefit from current gopher tortoise and red-cockaded woodpecker management plans.

Neither the current training activities nor the proposed activities are projected adversely affect the Gulf sturgeon. Comments received on the Draft EIS suggested that proposed ground-disturbing activities which increase erosion and sedimentation, which could adversely effect the Gulf sturgeon. Analysis of the erosion and sedimentation associated with the proposed training activities shows an insignificant contribution of sediment to the large offsite streams (e.g., Leaf River) which might provide habitat for the Gulf sturgeon. Consultation with the USFWS will be conducted as required. Therefore, no additional cumulative effects are expected.

Protection of threatened and endangered species will continue to be a priority concern of the Mississippi Military Department, National Guard Bureau, and U.S. Forest Service. Suitable habitat will be maintained and protective measures will continue under any of the proposed alternatives.

3.5.7 Biodiversity

Identification, delineation, and long-term monitoring (via the Army's Integrated Training Area Management or ITAM program) of riparian zones, pitcher plant bogs, and other unique or sensitive habitats is expected to be important in protection and conservation. Because of their importance to biodiversity, these areas are presently restricted in terms of military use, and no significant negative impacts are expected under any of the action alternatives. Additionally, threatened and endangered species management guidelines will continue to be followed under all of the alternatives. With the exception of Alternative 3B, the remaining alternatives are not expected to have any significant negative impacts on threatened, endangered and sensitive (TE&S) species (see Section 3.5.6 for additional discussion).

Military maneuvering, bivouacking, and other training activities within even-aged stands tends to create open areas and allows early successional plant species to become established, creating micro-habitats, which generally increases the number of plant and animal species occurring in an area. In most situations this localized increase in species richness does not constitute an increase in biodiversity. In keeping with the consensus of opinions of the Camp Shelby Biodiversity Committee (Chapter 6) discussions, cumulative impacts to biodiversity are considered in terms of how representative pre-settlement conditions of the permit area would be after the proposed habitat changes have occurred. Tracked vehicle activity and resultant forest fragmentation have been identified as the factors with the greatest potential for negative cumulative impacts to biodiversity, and are significant issues in Alternatives 1 through 4.

The effects from forest fragmentation under the action alternatives, particularly Alternatives 1 and 2, are difficult to mitigate. In addition, future clear-cutting on private or industrial holdings in close proximity to the permit area would magnify the negative impacts to area-sensitive species and other species sensitive to fragmentation. Projecting the location, extent and timing of future harvesting on non-government land is sometimes difficult because these contributing factors are not easily quantified. Mitigation efforts described in Sections 3.4.8 and 3.4.10 will reduce some but not all the effects attributed to military activity and forest fragmentation. The amount and configuration of proposed permanent open area under Alternatives 1 and 2 clearly represent a departure from attaining pre-settlement conditions, and therefore have a negative influence on biodiversity.

Under Alternative 6 there would no longer be tracked vehicle use or any other military activities, and all non-contaminated timber will be incorporated into the normal management base and stand rotation/cutting schedule, if not already incorporated. No permanent open areas would be created or maintained, but cutting to achieve annual harvest targets would still result in an abundance of edge, early to mid successional growth, and a level of forest fragmentation comparable to the present.

Mitigating the effects of all military activities in the permit area will not in itself restore the species and characteristics thought to be exhibited in the pre-settlement longleaf ecosystem. It is generally accepted that biodiversity in intensively managed, immature even-aged timber

stands are lower than that typically found in mature, mixed-aged forest of the same type that are relatively free from human disturbance. The establishment and maintenance of interconnected blocks of mature longleaf pine that are large enough to attract and sustain area-sensitive interior species will positively influence biodiversity, and thereby increase the likelihood that the area will contain the species associations and ecological communities characteristic of the pre-settlement longleaf ecosystem. As the U.S. Forest Service (USFS) has management responsibility of the majority of the land in the permit area, a fundamental shift in USFS policy would be required to significantly increase biodiversity under Alternative 6.

3.5.8 Quality of Life

3.5.8.1 Road Safety

All convoy movements take into consideration the safety of the public and military personnel. Camp Shelby has posted signs at those places where armored vehicle convoys are allowed to cross public highways. Property line signs are placed at regular intervals around the cantonment boundaries and a full-time security staff patrols these boundaries. Notices to the public are published in local periodicals with public awareness a top priority.

The location for the conduct of tracked vehicle maneuvers is proposed to be changed, therefore, the frequency and locations at which unit convoys cross public roads will change. These convoy crossings will be managed following these principles: convoy traffic will be consolidated and held to a minimum; convoys will be scheduled to cross public roads during least traffic periods to minimize public inconvenience; convoys will cross only at designated crossing areas and roadways will be clearly marked with warning signs preceding crossings; all convoys will cross only with road guards and escort and trail vehicles; some existing post roads utilized to access training areas will also change, thus possibly reducing required crossings; safety at road crossings will have absolute priority over training mission. Convoys will revert to administrative status, i.e., combat mode will be suspended, until safe road crossing is accomplished.

3.5.8.2 Training Noise

There would be no cumulative effect of training-related noise beyond that now experienced in the Camp Shelby vicinity. As discussed in Section 3.4.11, no additional heavy weapons will be added to the training requirements under any alternative. Air National Guard jet aircraft usage of the air-to-ground ranges will continue more or less the same as at present. Tow existing mitigation procedures relating to training noise will continue to be observed. The revision of the return-to-target flight path for Air Guard aircraft operating to the west range will continue to be standard procedure. This change, in mid-1993, decreased the direct effects of overflight for persons residing immediately south of the main Camp Shelby impact area. The decrease in tank firing associated with the end of the M60A3 special marksmanship training in 1991 has resulted in somewhat decreased noise levels in all areas where tank gunnery was a major noise contributor. Use of 120mm tank gun practice round also

generates slightly less noise per round fired than when using the 105mm round. In practice, these improvements in average noise generation are of the greatest importance to residents immediately south of the main impact area, mainly along Paret Tower Road. While weapons and aircraft noise are likely to continue to be the most common sources of diminished quality of life for local residents, no significant increase in these sources is associated with any alternative.

3.5.8.3 Impact by Alternative

For Alternatives 1 and 2, no new off-road tracked vehicle maneuver activities are proposed to take place west of Highway 29. Tracked vehicle maneuver in the southeast portion of the Special Use Permit (SUP) area will affect approximately 30 residences and involve traffic interruptions on two major county roads. For Alternative 1, PTA 3 reaches the SUP boundary on the north, near highway 98, and the town of New Augusta. For Alternative 2, training will not affect residents along Highway 98. There are several residences and one church south of PTA 4 along Highway 29 that may be affected.

For Alternatives 3A and 3B, no training activities are proposed to take place in the southern portion of the SUP area, thereby maintaining the quality of life (QOL) of residents living in this area. Alternative 3A proposes to use PTA 5, west of Highway 29. Traffic flow will be interrupted on Highway 29 at times when convoy movements involve crossing the highway. PTA 5 reaches the SUP boundary on the north, nearing Highway 98 and the town of Mahned. Alternative 3B proposes the use of PTAs 5 and 6, both of which are west of Highway 29. Greater movement will take place across Highway 29 under this alternative since there are two PTAs west of Highway 29. Fugitive dust may be present in association with field maneuvers and convoy traffic in all action alternatives. The effect by alternative would be dependent on soil moisture, wind speed and direction, and other variables. Other than dust abatement on roadways, as presented in Section 3.2.4, there are no plans for mitigation of fugitive dust from general offroad maneuver activities.

Alternative 4 proposes to maintain all current military training activities at the present level. It currently involves traffic interruption on Highway 29 and one major county road. Figure 2-1 shows the current ranges and training areas. There isn't a significant difference in the location of areas that are currently used and those that will be used for training under this alternative. Therefore, the effects on the quality of life of residents living near the SUP boundary will not be significantly different.

Since Alternative 5 proposes no off-road tank maneuver, QOL of residents near the SUP boundary will be improved in terms of dust annoyance since tanks would be confined to improved roads and trails.

Alternative 6 proposes to discontinue all military training at Camp Shelby. National Forest land now under the SUP (excluding the impact area) will return to multiple use management by the USFS. With the cessation of range firing, the QOL will improve for residents living adjacent to the current SUP boundary and in communities nearby.

3.5.9 Social Environment

The most serious effects which intrude on the social environment are, in practice, those which affect personal employment and other measures of economic well-being. These are examined in Section 3.5.10.1.

Some conflicts in recreation land use and access have been associated with military activities at Camp Shelby. According to a survey performed for this purpose, the public does not find the training schedule particularly burdensome, however. Military use is not expected to result in significant unmet recreation needs. Recreation use is also discussed in Section 3.5.11.

3.5.10 Economic Environment

3.5.10.1 Effect on Local Economy and Employment

The Economic Impact Forecast System (EIFS) was used to determine the effect of approximately 700 full-time permanent employees on the economy of a five county area. Camp Shelby contributes 2.45 percent of the total employment in the five county area and accounts for 3.68 percent of the local sales volume (Section 3.1.4.1.1). In addition to this direct quantifiable impact, Camp Shelby also has secondary impacts on the local economy. As the country's largest National Guard and Reserve Training site, Camp Shelby routinely hosts personnel from all across the southeast. Although the exact number of civilian business employees who are indirectly involved in support of Camp Shelby activities cannot be quantified, the number is believed to be significant.

Alternatives 1, 2, 3A, 3B, 4, and 5 would require, to varying degrees, construction of facilities improvements and maintenance and operational activities. Therefore, they are expected to have a small positive effect on the economy due to employment opportunities and materials requirements for the construction projects.

With Alternative 6, military training and other functions would be discontinued. This option would eliminate Camp Shelby as a source of employment. This option would also have a negative effect on the businesses that are associated with weekend and annual training. There would also be an adverse effect on local suppliers of goods and services to Camp Shelby.

No measurable effect on the local or regional economy is anticipated under any of the Alternatives 1, 2, 3A, 3B, or 4. A small negative effect is predicted for Alternative 5 and a larger negative effect for Alternative 6.

3.5.10.2 Effect on the Forest Industry

For all alternatives the effects of implementation would be minor. During the implementation period, 4-5 years, Forest Service timber sale volumes would approximate the 1991 levels. Under all alternatives there would be about a 2 MMBF short term increase in the volume sold. The increase would come as returned tank areas were eligible for and received harvest

cuts. This would benefit local logging contractors by providing more work closer to their base of operations resulting in lower costs. Volumes comparable to the implementation volumes would be deferred to maintain a steady flow of timber through the first three periods, Table 3-26.

Alternatives 1 and 2 would have reductions from current management of about 2 MMBF annually during the fourth period. These reductions would stabilize at 5-6 MMBF annually after this. All other alternatives would have long term (40 years) increases ranging from 1 to 4 MMBF annually. With current mill capacity in the local market area in excess of 500 MMBF annually, implementation of any alternative would have little or no effect on wood product manufacturers. Local logging contractors may be expected to see a long term effect on travel and hauling costs which would be either negative or positive depending upon whether local supplies increased or decreased. Since their annual production ranges from 8 to 20 MMBF, this effect may be termed modest at most for any alternative.

The managed timber base will be affected to varying degrees by the alternatives, as displayed in Table 3-24. Alternatives 1 and 2 will result in a moderate reduction in the pine timber base while alternatives 3A, 5, and 6 will increase it in increasingly significant amounts.

The effects of reducing the Forest Service managed timber land base through withdrawal for tank maneuvers and other military activities are further compounded by current and probable future reductions in the managed land base for threatened and endangered species management, large rights-of-way for interstate highways and similar withdrawals. This creates an increase in the passive negative effects of increased stumpage prices, increased travel from the home operations base, and increased hauling costs resulting from the ever increasing purchasing zone from any given mill.

The overall effect on the timber industry is modest regardless of which alternative is implemented, refer to discussion in Section 3.5.4. The large amount of timberland in the De Soto National Forest marketing area reduces much of the impact from changing the managed pine timber base. The effect on supply - demand is negligible over the short term, but increases over lengthening time frames.

The forest products industry is increasingly turning its attention to the South as nationally known companies expand their timber operations in the area. These companies have integrated operations where various combinations of plywood, veneer, pulp, chips, pole-piling, and lumber are produced at the same location.

While the timber industry is expanding its operations in the lower coastal plain, the number of pole-piling companies is declining. Longleaf pine is the tree of choice for pole-piling. Throughout this region, much of the longleaf on private lands is being converted to other, easier to manage pine species. Reduced supplies of pole quality timber, integrated operations, and strict Environmental Protection Agency (EPA) regulations have all contributed to this decline.

Most of the area to be withdrawn in Alternatives 1, 2, and 3B is in the longleaf pine timber type as are the tactical aviation areas and the multiple purpose range complex-heavy (MPRC-H) sites.

3.5.10.3 County Returns

An examination of Tables 3-25 and 3-26 shows no negative long term (up to 40 years) effect from implementing any alternative when compared to current management. Implementation of any of the alternatives may be expected to increase contributions to the county return pool by about $100,000 annually during the first 10 year period. Any changes in county returns receipts would be distributed among the 10 counties sharing these receipts (Section 2.6.3.1).

3.5.10.4 Effect on Mineral Industry

Conditions under which mineral exploration and extraction are carried out will not change significantly. No cumulative impacts are anticipated at the current level of demand.

3.5.11 Recreational Use

The presence of Camp Shelby and its associated activities result in mixed consequences for recreation use. The thought of a well-managed military reservation may be perceived differently than a well-managed National Forest by potential recreation users. Disturbances such as weapons discharges, vehicle traffic, and aircraft noise, may individually not spoil the enjoyment of the National Forest. However, such activities may combine to result in an unfavorable experience.

Development of the proposed training areas and inter-connecting corridors will limit (for the life of the PTAs and corridors) the opportunity to develop various trail systems and associated facilities within the affected area. This constraint will occur to varying degrees depending on the alternative selected.

The cumulative effects on potential recreation development is to concentrate the opportunity for development on a smaller area of National Forest land. The effect is greater for Alternatives 1 and 2 because the area selected for expansion of tank maneuvers has the best potential for recreational development, that is, other than hunting related. The effects for Alternatives 3A and 3B is less because the area and intensity of development for tank maneuvers is less. Opportunities under Alternative 4 will be essentially unchanged from those now available (see Section 3.1.3.4). Under Alternative 5, no maneuver conflicts with recreational users will take place. Under Alternative 6, no conflicts with access to either range safety fans or unit maneuvers will be found. The potential exists for increased hunting use of areas like the Red Creek Wildlife Management Area and Pascagoula Wildlife Management Area.

3.5.12 Leaf River Wildlife Management Area

Cumulative effects (Alternatives 1 and 2) in the Leaf River Wildlife Management Area will closely parallel those previously described (this Section) for Camp Shelby because the LRWMA is included in these assessments. The most noteworthy change in the LRWMA will occur in vegetation community structure due to forest clearing and thinning to facilitate military training. Timber harvesting in the LRWMA under Alternatives 1 and 2 would be accelerated compared to normal USFS cutting schedules and will alter existing habitats. This will change the long term production of wildlife in the LRWMA by shifting community composition and favor species requiring fragmented patches and edge habitat (i.e., whitetailed deer). Species requiring interior habitats will be most affected and are expected to decrease, therefore reducing biodiversity.

Other impacts would also include soil loss and compaction, increased runoff and reduced subsurface drainage, increased export of nitrogen and phosphorus, and some stream sedimentation. These impacts, although mitigated, will alter the functional ecology of the LRWMA. However, it is unknown whether and to what degree, these effects are more or less detrimental than current forest management practices involving thinning, clearcutting, herbicide usage, and heavy equipment operation.

Access to interior portions of the LRWMA that were previously not utilized by recreationists will probably increase and may provide greater hunting opportunities. However, increased access may be negative for some LRWMA users. Those seeking minimal contact with other recreationists will find increased access detrimental to their outdoor experience.

3.6 Irreversible and Irretrievable Commitment of Resources

There are relatively few anticipated irreversible and irretrievable commitments of resources associated with this proposed action. All training area development is seen as involving renewable resources. Within a relatively short time, as little as 15 to 25 years, the consequences of military use may largely be obscured, with some exceptions as noted below. A fully forested condition may be achieved with relatively little effort beyond normal reforestation practices in that length of time.

<u>Impact Area</u>: The impact area, which is contaminated with unexploded ordnance, consists of an area of about 4,500 acres and has been in use since 1942. Because of the nature of this land use, it is considered impractical, or at least very costly, to return the impact area to its previous state. The present action does not propose expansion of this dedicated area, nor an increase in the level of usage of any type of ammunition which could produce potentially dangerous unexploded rounds. All firing range facilities proposed for construction in this EIS, specifically including the Tank Table VIII and the MPRC-H, will use only training practice rounds, which do not contain an explosive charge, and thus cannot cause a residual safety hazard in their impact area. Under Alternative 6, even this usage will stop.

Permanent Facilities: Some of the proposed training facilities discussed in Section 1.3 above may be considered an irreversible and irretrievable commitment of resources to the extent that these facilities are permanent in nature. While it is possible to demolish the facilities and improvements once constructed, this is not likely to take place. To all practical purposes, such permanent construction may be termed irreversible. Under Alternative 6, no construction would take place.

Fossil Fuel Consumption: Many military activities, especially those including usage of tracked vehicles and aircraft, consume large quantities of petroleum products when operating. Such consumption may be termed an irreversible commitment of these resources, since they are not recoverable or renewable. Implementation of Alternatives 1 and 2 suggest increased travel distances to and from training areas, thus increasing fuel consumption by some degree. The proposed Alternatives 3 and 4 do not appear to imply increases in usage of fossil fuels. No added vehicles, different types of vehicles, or increases in distances traveled are contemplated. The set of actions may thus be considered as having implications ranging from slightly increased consumption (Alternatives 1 and 2), through energy neutral (Alt 3A, 3B and 4) to some reduction in use (Alternative 5), to Alternative 6, where military use ends at Camp Shelby. The likelihood that there would be a compensating increase in usage at other training sites under Alternatives 5 and 6, for no net change in National Guard usage, is high.

Soil Loss: Under Alternatives 1, 2, 3A, 3B, and 4, there will be some losses of top soil from training areas which are in excess of normal losses from forested lands. Because the soil forming process is extremely slow, this loss may be considered irretrievable in practical terms.

Cost of Closure: Under Alternative 6, Camp Shelby is proposed to be closed (Section 1.2.7). The cost of this closure may be considered an irreversible commitment of capital resources. These cost take several forms. Closure of Camp Shelby would require a variety of studies be conducted under several statutes. These include but are not limited to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended by the Community Environmental Response Facilitation Act (CERFA), the National Environmental Policy Act (NEPA), and the Resource Conservation and Recovery Act (RCRA)

Closure would require a reassignment of the missions currently provided by the facility. An Environmental Impact Statement examining the environmental and socioeconomic effects of transfer of these missions to other facilities as well as the environmental effects of closing the facility, cleanup of potential environmental contamination, and restoration of the environment would also be required before disposal of the facility.

Significant steps in preparing land for disposal include the certification that lands are suitable for disposal and the cleanup of contaminated sites to the degree required by any proposed future use. The CERFA amendment to CERCLA requires that the agency disposing of the property identify clean parcels and to expedite the remedial investigation, feasibility study, and clean up of potentially contaminated sites. CERFA also requires that the disposing agency, in cooperation with local communities, identify real property that offers the greatest

opportunity for reuse and redevelopment where operations are terminating. The agency must identify uncontaminated property through a process that includes record and title searches, inspection of the property and aerial photographs, interviews, and sampling if appropriate. The identification of clean parcels is complete when the concurrence of the administrator of the U.S. Environmental Protection Agency (EPA) is obtained.

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Final
Environmental Impact Statement

Military Training Use of National Forest Lands: Camp Shelby, Mississippi

Chapter 4

CONCLUSIONS AND RECOMMENDATIONS

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

4.1.1 Effects Prior to Mitigation

The following discussion within Section 4.1.1 is largely theoretical. It states the effects which would be realized if no protective or mitigative measures were to be taken. Since none of the proposed actions would be allowed to take place in the absence of these measures, the material presented here is largely for purposes of comparison with the actual predicted effects.

4.1.1.1 Summary of *Potential* Effects by Alternative

Alternative 1: Measurable effects would be possible over the largest area in the new battalion task force maneuver areas (Alternative 1) in terms of *potential* for possible vegetation damage, subsequent soil erosion and deposition, wetland damage and threatened, endangered and sensitive (TE&S) species habitat loss. The proposed maneuver areas were located so as to minimize these effects, however, there will be unavoidable modifications to the areas involved. Vehicle noise effects and traffic disruption will be greater for residents in and near the southern part of the permit area.

Alternative 2: Measurable effects similar to those in Alternative 1 would be realized, though over a slightly smaller area, in the new company team maneuver areas (Alternative 2) in terms of vegetation damage, subsequent soil erosion and deposition, wetlands damage and TE&S species habitat loss. Again, the areas were located so as to minimize these effects, but the *potential* for significant effects remains. Similar to Alternative 1, vehicle noise effects and traffic disruption will be greater for residents in and near the southern part of the permit area.

Alternative 3A: Measurable effects similar to those in Alternative 2 would be realized but on a considerably smaller land area. This Alternative is restricted by the need to provide an analysis of maneuver training north and west of Forest Service Road 303. An effort was made to locate the training areas on durable lands but because of the restriction, training area 5 does not contain much usable land area. Slightly greater disruption of quality of life would be expected to persons living along Highway 29 and FS 303 and somewhat more frequent traffic disruption on these highways is associated with this alternative as compared with Alternative 1.

Alternative 3B: Measurable effects would be realized over a large amount of area in terms of potential for vegetation damage, subsequent soil erosion and deposition, wetlands damage and TE&S species habitat and habitat loss. In the definition of this alternative, however, the new training areas were required to be located north and west of Forest Service Road 303 and Mississippi Highway 29, and the land available contains much more wetland area and TE&S

species habitat than areas included in Alternatives 1-3A. This alternative is unacceptable, with or without mitigation and impact avoidance measures, to the US Fish and Wildlife under the terms of the Endangered Species Act due to its potential for effects on the gopher tortoise, a threatened species.

Alternative 4: Most effects would be similar to those experienced with the present level of training. This is not, however, a status quo alternative. For example, in 1992 and 1993, present maneuver training areas received total rehabilitation measures on 100% of the damaged areas. With the full implementation of Integrated Training Area Management (ITAM), all areas needing repair will continue to receive needed rehabilitation within a specified time frame in accordance with the new Special Use Permit (SUP). The "without mitigation" effects are not meaningful in this context, because the *present* conduct of training activities includes many far reaching mitigation and impact avoidance measures, which will continue in any case. Effects related to noise, traffic delays, and other quality of life elements, are anticipated to be similar to those of recent years, which represent a significant decrease from the later 1980s.

Alternative 5: No off road tracked vehicle maneuver training will be done under this alternative; therefore, all present designated tracked vehicle maneuver training areas will be turned back to the Forest Service and managed according to their policies. The National Guard does not envision a mission for an installation without maneuver training available, and proposed to close the facility over a period of time. Significant negative economic consequences would result from elimination of most or all of the 700 employees who now support Camp Shelby.

Alternative 6: The National Guard would not hold a Special Use Permit for any activities, and the installation would cease all operations over some period of time, probably one to two years. Significant negative economic consequences would result from elimination of all of the 700 employees who now support Camp Shelby. Quality of life elements, including noise and traffic interruptions would improve for all nearby residents.

4.1.1.2 Summary of *Potential* Effects by Individual Facilities Project

Tank Table VIII (Alternatives 1, 2, 3, 4, & 5): There will be a significant local effects on the landform of the area and high *potential* for severe soil loss and resultant water quality and wetland effects, because developing proper lines of sight for tank gunnery will require 175,000 cubic yards of soil to be removed from a low ridge within the range. Some wildlife species in localized areas will be negatively impacted from timber removal. However, most resident species will not be impacted to a greater degree than present. Some residual impacts to wildlife from timber removal are expected to be possible. There is potential for locally significant damage to one gopher tortoise colony which is at the edge of the area proposed to be modified for this project.

MPRC-H (Alternatives 1,2, & 3): Significant potential is present for soil and vegetation disturbance. Work at the primary site would require relocating or avoiding some single tortoise burrows, while the alternate site contains numerous individual burrows and several tortoise colonies (as opposed to single burrows), which cannot be relocated within guidelines. The 1992 and 1993 Biological Opinions from the U.S. Fish and Wildlife Service (USFWS) do not allow development of the alternate site. In contrast, the primary site has substantial wetland areas of concern, and many soils areas are below average in terms of having high erosion potential and low revegetation potential. The relief of the area will also require much earth work for roadway fills, including roads across wetlands. The alternate site has less relief, fewer wetland areas, soils lower in erosion potential and higher in revegetation potential; however, the problems with the gopher tortoise preclude further consideration. Impacts to some resident wildlife species from timber removal, road building, earth-moving, and other construction activities will occur. Several acres of closed-canopy forest will be converted to open areas resulting in increased predation rates, nest parasitism, noise disturbance, etc.

Tank Wash (Alternatives 1-5): Displacement of resident wildlife is expected and will likely be permanent. Even though the areas are relatively small, they will paved or graveled, leaving very little if any habitat. Implementation will decrease groundwater withdrawal by up to 500,000 gal per day due to washwater recycling.

EOD (Alternatives 1-5): Though the sites are small, most wildlife species now present will be displaced during construction activities through the loss of herbaceous cover and nesting sites prior to mitigation. However, since this facility will be constructed within the impact area, which already subjects species living in the area to other dangers, impacts following mitigation are expected to be insignificant.

CALFEX-AA (Alternatives 1-5): Soil disturbance and small effects on bird species and other wildlife species may be expected at times of increased troop activity. The area involved is not large, and major, long-term effects are unlikely.

Tactical Aviation Training Areas (Alternatives 1-3): Tactical Aviation Sites 1,3,4, and 8 are preferred when considering potential impacts to environmentally sensitive resources. None of the recommended sites will conflict with constraints with the proposed mitigation measures in place during construction and operation. Many wildlife species within 100 meters (about 325 ft) of the aviation sites will be subjected to a greater level of military activity and noise than at present. Troops will also bivouac near these areas causing more vegetative disturbance by digging foxholes, parking vehicles, and foot traffic. Noise will still be a problem confronting wildlife species even following mitigation, perhaps permanently displacing certain shy species. None of the recommended sites falls within 3/4 mile of a red-cockaded woodpecker colony site, and only one has any known gopher tortoise burrows (site 3 has one isolated burrow). Uncontrolled implementation of other than the environmentally-preferred sites could result in significant effects on soils, endangered species and wetlands depending on the sites chosen (see the Figures 3-3 to 3-13). At least one site originally preferred by Camp Shelby personnel for tactical purposes cannot be developed without unacceptable effects.

4.1.2 Effects of Facilities Projects Remaining Following Mitigation

Each of these projects involves a construction site, and associated earthmoving and building actions to some degree. While some sites are very large, e.g. the multiple purpose range complex-heavy (MPRC-H), the procedures for managing soil loss, the most prevalent problem, are well known. All the projects will require removal of some forested area, although some sites have very few large trees, and reduction in potential wildlife habitat is likely.

Tank Table VIII (Alternatives 1, 2, 3, 4, & 5): There will be a significant local effects on the landform of the area and high *potential* for severe soil loss and resultant water quality and wetland effects. Creating a line of sight for tank gunnery will require that about 175,000 cubic yards of soil (about 5 to 6 feet removed over a 6 acre area) to be removed from a ridge on the range. The soil will be used for berms and roadway fill, but will not be used to fill wetlands. Some wildlife species in localized areas will be negatively impacted from timber removal, although much of the site is heavily used now for tank gunnery. There is potential for locally significant damage to one gopher tortoise colony which is at the edge of the area proposed to be modified for this project. The 1992 and 1993 Biological Opinions specifically allow for the relocation of the animals in this one colony. No other significant environmental effects are expected, because previous usage as a tank gunnery range (Range 45) has changed the environmental setting over several years.

MPRC-H (Alternatives 1,2,3 & 5): Mitigation will be necessary for soil and vegetation disturbance and possibly for relocating or avoiding some single tortoise burrows. The alternate site has less relief, fewer wetland areas, soils lower in erosion potential and higher in revegetation potential; however, there are several sizeable colonies of the gopher tortoise that will have to be taken into consideration. The 1992 and 1993 Biological Opinions from the USFWS do not allow development of the alternate site due to the presence of gopher tortoise colonies. In comparison, the primary site has substantial wetland areas of concern, the soils are generally poor in terms of high erosion potential and low revegetation potential and the relief of the area will require much earth work. Impacts to some resident wildlife species from timber removal, road building, earth-moving, and other construction activities will occur. Several acres of closed-canopy forest will be converted to open areas resulting in increased predation rates, nest parasitism, noise disturbance, etc., for which no full mitigation is possible.

Tank Wash (Alternatives 1-5): Displacement of resident wildlife is expected and will likely be permanent. Even though the areas are relatively small, they will be paved or graveled, leaving very little if any habitat. Impacts caused from timber removal and construction are expected to be insignificant following mitigation. No significant effect with mitigation regarding soil & vegetation disturbance. Implementation will decrease groundwater withdrawal by up to 500,000 gallons per day of use due to washwater recycling.

<u>Explosive Ordnance Disposal (EOD) Facility (Alternatives 1-5)</u>: No significant effect with mitigation regarding soil and vegetation disturbance. Many wildlife species will be displaced during construction activities through the loss of herbaceous cover and nesting sites prior to mitigation. However, since this facility will be constructed within the impact area, which already subjects species living in the area to other dangers, impacts following mitigation are expected to be insignificant.

<u>Combined Arms Live Exercise Assembly Area or CALFEX-AA (Alternatives 1-5)</u>: No significant effect with mitigation regarding soil disturbance. Since the area involved is not very big, long-term effects are unlikely. Some bird species and other wildlife species may be displaced at times of increased troop activity. However, impacts to wildlife are expected to be insignificant with mitigation.

<u>Tactical Aviation Training Areas or TAAs (Alternatives 1-3)</u>: Tactical Aviation Sites 1, 3, 4, and 8 are preferred when considering potential impacts to environmentally sensitive resources. None of the recommended sites will conflict with constraints with the proposed mitigation measures in place during construction and operation. Many wildlife species within 100 meters (about 325 feet) of the aviation sites will be subjected to a greater level of military activity and noise than at present. Troops will also bivouac near these areas causing more vegetative disturbance by digging foxholes, parking vehicles, and foot traffic. Therefore, negative impacts will occur prior to mitigation. Noise will still be a problem confronting wildlife species even following mitigation, perhaps permanently displacing certain species. None of the recommended sites fall within 3/4 mile of an inactive red-cockaded woodpecker colony site, and only one has any known gopher tortoise burrows (Site 3 has one isolated burrow). With careful planning and adherence to management recommendations, impacts to gopher tortoise on Site 3 can be avoided. Uncontrolled implementation of other than the environmentally-preferred sites could result in significant effects on soils, endangered species and wetlands depending on the sites chosen (see Figures 3-3 to 3-13). At least one site originally preferred by Camp Shelby personnel for tactical purposes cannot be developed without unacceptable effects, and has been withdrawn from consideration. Other adequate sites exist, and development of this unsuitable site should not be required.

4.1.3 Summary of Impacts by Alternative and Environmental Topic Following Mitigation

Most intensive uses of natural resources cause at least short term effects, either positive or negative depending on the type of ecosystem in question. The key is to manage these effects, through mitigation, to a degree that allows the ecosystem to function and sustain itself. Implementation and operation of any of the action Alternatives 1-3B will result in moderate short term effects and minor long term negative effects on soils, surface water, wetlands, and ground cover. With one exception, that of Alternative 3B, the same pattern is seen in terms of effects on wildlife species. As noted in Section 3.3.2.5.3, Alternative 3B cannot be implemented without, in the opinion of the U.S. Fish and Wildlife Service, endangering the survival of the gopher tortoise, a threatened species. With this exception, however, by maintaining current mitigation procedures and integrating the proposed procedures, negative effects can be managed within reasonable tolerance levels. For example, the soil

erosion/deposition predictions discussed in Chapter 3 indicate that soil erosion can be maintained at or below the tolerance level for the particular soils that are included in the proposed trackable areas. Therefore, we believe there will be no significant effects remaining following mitigation for any of the action alternatives or Alternatives 5 or 6.

The scale represented on this table ranges, in theory, from "+++" (meaning definitely beneficial), through "0" (zero) (meaning no net change overall), to "– – –" (meaning definitely detrimental).

The basis or standard for comparison of alternatives is the present status of the environment, based on current uses and facilities (see Section 3.1 above). If the present status is set at 0 on the above scale, the environmental effects anticipated (long and short term), are then displayed as no change or some positive or negative deviation from the present status. Although Alternative 4 has been popularly said to represent the status-quo among the 6 alternatives, the scores assigned do not always reflect the *present status* of the environment. The scores reflect the *anticipated future status* utilizing proposed mitigation procedures (see Section 3.4) that will apply for any of the Alternatives, 1 through 5, which may be implemented. It is noted that "long term" and "short term" are quite relative. For certain resources, such as groundcover and certain small game species, the short term may be realized well within ten years -- perhaps no more than four to five years. For others, such as timber supply, the long term may only be approached in 40 to 60 years. Ten years is thus arbitrary, but useful, as a dividing line. In the case of the military value, which is not an "environmental" element, but has been included for comparison purposes, the ten year time frame is the planning frame of reference for a new SUP, and projections beyond that time are not being made at this time.

Anticipated impacts from the 7 alternatives have been separated into short and long term effects because the combined impacts of the implementation and construction phases, potentially are more severe on specific environmental attributes. However, for some alternatives the long term impacts, both positive and negative, may be moderated as a result of mitigation measures. The following paragraphs are interpretations of the scores, short and long term, assigned to each environmental topic relative to each alternative summarized in Tables 4-1 and 4-2.

We especially note that many improvements in ongoing environmental protection and management procedures have been and are being put in place at Camp Shelby, both as a result of these studies and as part of the implementation of the ITAM program. Thus several areas show expectation of positive changes for Alternative 4. This is thus *not* the "no change" alternative. Strictly speaking, there *is* no situation in which absolutely no change is expected to take place when the anticipated improvements are considered.

A separate section of Table 4-1 summarizes the suitability of each of the alternatives to meet the full mission needs of the Mississippi Army National Guard. While this is not an environmental impact, the same method of displaying the effect is used, i.e. a rating from +++ through 0 to – – –. As discussed in the previous paragraph, Alternative 4 is not strictly

a status quo proposal from the military training point of view, as well as from the environmental protection perspective. A series of added training facilities (See Sections 1.3.1 through 1.3.6) will add to the field maneuver capability under each action alternative, including Alternative 4.

Table 4-1

Environmental Impacts with Mitigation Actions - Short Term (<10 Years)
(Rating scale: +++ = very beneficial through 0 = no change to – – – = very detrimental)

Environmental Topic	ALT 1	ALT 2	ALT 3A	ALT 3B	ALT 4	ALT 5	ALT 6
Wildlife Habitat (overall)	–	–	0	+	0	+	+
T, E and S Species*	0	0	0	– – –	0	+	+
Biodiversity	–	–	0	–	0	+	+
Birds / Neotropical Migrants	– –	– –	–	–	0	+	+
Quality of Life	0	0	–	– –	0	+	++
Outdoor Recreation	+	+	0	0	0	0	+
Military Training Noise	0	0	0	0	0	0	++
Local Employment	0	0	0	0	0	–	– – –
Regional Economy	0	0	0	0	0	–	– –
Timber Harvest/Industry	+	+	0	0	0	+	+
Soil Damage	– –	– –	–	– – –	+	++	+++
Soil Erosion/Deposition	– –	– –	–	– –	+	++	++
Surface Water Quality	– –	– –	–	– –	+	++	++
Wetland Integrity	–	–	0	–	+	+	+
Wetland Loss	0	0	0	0	+	+	+
Ground Cover	–	–	0	–	+	+	+

* - Threatened, Endangered and/or Sensitive

Military Training Values	Alt1	Alt2	Alt 3A	Alt 3B	Alt4	Alt5	Alt6
Military Training Requirements (With New Training Facilities)	+++	++	++	+	+	– –	– – –

We must also note that a score of zero ("0") does not mean that there is no effect or no problem. The remaining problems or impacts may well be the *same* as at present. The "0" means simply that there is expected to be no *change* in the type or level of impact. Several areas of examination concluded that little could be done about the source of a type of effect, and that it was projected to continue under some or all alternatives.

Beyond the summary observations contained in Tables 4-1 and 4-2, where the professional judgement of the preparers was the source of the majority of the conclusions, quantitative data are available for certain aspects of the proposed alternatives. Table 4-3 presents in comparative form several environmental characteristics which may be determined to be different from one alternative to another and also have potential for relevance to environmental decision making. They represent, in most cases, raw data drawn from a variety of sources. Not all elements may automatically be considered significant, or even necessarily relevant to any particular decision. They are provided in response to requests for quantitative differences among alternatives.

Table 4-2
Environmental Impacts with Mitigation Actions - Long Term (>10 Years)
(Some resources require up to 50 years to attain "Long Term" characteristics)

Environmental Topic	ALT 1	ALT 2	ALT 3A	ALT 3B	ALT 4	ALT 5	ALT 6
Wildlife Habitat (overall)	+	+	0	+	0	+	+
T, E and S Species*	0	0	0	---	0	+	+
Biodiversity	–	–	0	–	0	+	+
Birds / Neotropical Migrants	–	–	0	0	0	++	++
Quality of Life	0	0	–	--	0	+	++
Outdoor Recreation	+	+	0	0	0	0	+
Military Training Noise	0	0	0	0	0	0	++
Local Employment	0	0	0	0	0	–	---
Regional Economy	0	0	0	0	0	–	--
Timber Harvest/Industry	0	0	+	0	0	++	++
Soil Damage	–	–	0	--	+	+	++
Soil Erosion/Deposition	–	–	0	--	+	++	++
Surface Water Quality	–	–	0	--	+	+	++
Wetland Integrity	0	0	0	0	+	+	+
Wetland Loss	0	0	0	0	+	+	+
Ground Cover	0	0	–	–	+	+	+

* - Threatened, Endangered and/or Sensitive

Table 4-3 Quantitative Comparisons Among Alternatives for Environmental Factors (Pages 4-9 and 4-10)

Quantitative Elements for Alternatives 1-3B	Alt 1	Alt 2	Alt 3A	Alt 3B	Most Comparable Quantitative Element for Alternative 4	Alt 4
Total gross acres in study area for maneuver area planning	35,512	31,824	11,601	21,883	Total acres currently authorized to be used for tank maneuvers	17,561
Acres within PTAs and corridors that are proposed to be thinned	5,916	6,262	2,724	5,995	Acres within T-areas that are currently thinned	9,192
Acres within PTAs and corridors that are proposed to be cleared	14,939	12,738	4,517	5,273	Acres within T-areas that are currently cleared	6,633
Total acres of longleaf pine within study area	18,821	16,854	4,586	9,823	Acres of longleaf pine within currently authorized T-areas	7,839
Acres of longleaf pine within PTAs and corridors that are proposed to be thinned	3,861	4,006	1,420	3,786	Acres of longleaf pine within T-areas that are currently thinned	4,800
Acres of longleaf pine within PTAs and corridors that are proposed to be cleared	7,761	6,564	1,591	1,844	Acres of longleaf pine within T-areas that are currently cleared	2,939
Total acres of present open area within study area	7,111	5,404	3,336	4,822	Total acres of present open area within T-areas	5,712
Total acres of proposed open area within study area	18,224	15,060	5,747	6,841	Total acres of proposed open area within T-areas	--
Total linear miles of present edge within study area	313	282	105	202	Total linear miles of present edge within T-areas	168
Total linear miles of proposed edge within study area	612	541	176	351	Total linear miles of proposed edge within T-areas	--
Potential number of forest fragments within PTAs and corridors	15	14	3	7	Number of forest fragments currently within T-areas	47
Acres within the LRWMA (43,535 acres) that are proposed to be cleared	8,540	8,540	0	0	Acres within the LRWMA that are currently cleared	0

Table 4-3 Quantitative Comparisons Among Alternatives for Environmental Factors (Pages 4-9 and 4-10)

Quantitative Elements for Alternatives 1-3B	Alt 1	Alt 2	Alt 3A	Alt 3B	Most Comparable Quantitative Element for Alternative 4	Alt 4
Acres within the LRWMA (43,535 acres) that are proposed to be thinned	3,827	3,827	0	0	Acres within the LRWMA that are currently thinned	0
Set aside acres for RCW colonies and buffer within PTAs and corridors	4,124	2,785	1,424	4,255	Set aside acres for RCW colonies and buffer within T-areas	3,617
Set aside acres for GT colonies and buffer within PTAs and corridors	454	460	121	898	Set aside acres for GT colonies and buffer within T-areas	927
Total number of GT colonies within PTAs and corridors	21	20	8	31	Total number of GT colonies within T-areas	16
Total active burrows in GT colonies within PTAs and corridors	199	193	77	392	Total active burrows in GT colonies within T-areas	224
Total active semi-isolated GT burrows within PTAs and corridors	12	12	4	25	Total active semi-isolated GT burrows within T-areas	13
Total active burrows within PTAs and corridors	244	238	82	422	Total active burrows within T-areas	242
Proposed relocations of GT from the impact area	62	62	62	62	Proposed relocations of GT from the impact area	62
Proposed relocations of GT within PTAs and corridors due to isolation	46	34	9	NC	Proposed relocations of GT within T-areas due to isolation	None
Acres of unoccupied GT priority soil within PTAs and corridors	1,708	1,593	146	170	Acres of GT priority soil within T-areas	691
Set aside acres for stream head and buffer within PTAs and corridors	1,906	1,363	1,053	1,201	Set aside acres for stream head and buffer within T-areas	820
Acres proposed for available tracked use within PTAs and corridors	17,459	15,995	5,820	9,036	Acres currently used for tracked use within T-areas	11,087

Table 4-3 Quantitative Comparisons Among Alternatives for Environmental Factors (Pages 4-9 and 4-10)

Quantitative Elements for Alternatives 1-3B	**Alt 1**	**Alt 2**	**Alt 3A**	**Alt 3B**	**Most Comparable Quantitative Element for Alternative 4**	**Alt 4**
Potential number of wetland crossings within PTAs and corridors	78	72	28	49	Number of wetland crossings within T-areas	NA
Set aside acres for wetlands and buffer within PTAs and corridors	6,907	6,736	1,126	3,553	Set aside acres for wetlands and buffer within T-areas	3,029
Potential for soil loss - over entire permit area - (tons/acre/year	73	66	41	44	Potential for soil loss - over entire permit area - (tons/acre/year)	39
Acres within current tank areas	6,094	3,337	3,928	6,000	Acres of current tank areas	17,561
Acres of new tank areas	28,096	26,949	5,997	13,071	Acres of new tank areas	0
Acres of returned tank areas	8,724	11,399	10,529	8,754	Acres of returned tank areas	0
Total change between new and returned tank areas	-19,372	-15,550	+4,532	-4,317	Total change between new and returned tank areas	0
Maneuver area available outside tank main gun safety closure area	17,459	15,995	5,820	5,820	Maneuver area available outside tank main gun safety closure area	7,192
NC - Project Not Considered NA - Information Not Available						

4.1.3.1 Discussion of Effects by Environmental Topic Area

Within this section, each major environmental topic is examined at an overview level, and then the differential effects of the different alternatives are presented.

4.1.3.1.1 Wildlife Habitat (Overall)

Impacts to wildlife may result from timber removal, structural alteration (earth-moving) of the land required to develop the proposed training areas (PTAs) and corridors, and subsequent training activities. Initial construction activities will have the immediate effect of displacing most resident wildlife species to other areas (some displacement may be permanent), the loss of woody and herbaceous cover, and potential nesting, perching, and foraging sites. Forest modification in proposed maneuver areas will be extensive, thereby creating more open area and edge habitat within the forest (Section 3.3.2.6). Timber not thinned or cleared will be connected to other stands whenever possible. When appropriate, remaining forest fragments will be connected via a forested corridor or planned in such a way as to minimize forest fragmentation and provide adequate avenues of dispersal for the majority of woodland species. Depending on the final clearing schedule, there may be a greater quantity of woody debris left on the ground compared to normal timber removal operations. This woody debris, if left, will provide cover and perching sites in the short term, and as the debris begins to break down it should attract a greater variety of invertebrate and vertebrate species. Snags (standing dead trees) and down woody debris are heavily utilized by an array of birds, mammals, amphibians, reptiles, and invertebrates, and are now accepted as an integral part of the forest ecosystem (Davis, 1983). Species tolerant of human activities or those preferring disturbance-type habitats will likely return after a short period if suitable habitat remains (Section 3.3.2.4).

Forest fragmentation is a major factor in the decline of many species, both in this country and world-wide. Predators and brood parasites of forest interior species are among the few bird species that have most likely benefitted. The creation of edge corridors through contiguous tracts of forest has allowed the brown-headed cowbird (a brood parasite) and the blue jay to expand their distributions at the expense of other species (Section 3.1.2.6). It is not uncommon for relatively mobile animals to respond to noise by running or fleeing away from the source(s) to another area. This type of response does have the potential to produce some negative consequences.

Each of the action alternatives will favor those species utilizing edge habitats, some of which provide important recreational opportunities to the hunting public. Interior species that require larger contiguous stands will not benefit from the proposed timber removal plan. The return of present tracked vehicle training areas to forest management offsets the creation of open areas to some degree and will likely result in reduced net negative cumulative effects.

The expansion of edge into the forest has not benefitted those species requiring conditions more representative of forest interior such as the brown-headed nuthatch, pine warbler, and the pileated woodpecker. Preliminary analysis of Land Condition-Trend Analysis (LCTA)

small-mammal trapping data conducted for this Final EIS indicates that small mammals tend to be more abundant in areas dominated by herbaceous vegetation interspersed with woody plants than in closed-canopy forested areas with a sparse vegetative (i.e. mature forest) ground cover. However, not all wildlife species can tolerate edge or early successional habitat, so existing Camp Shelby activities have somewhat altered animal distributions (Section 3.1.2.4 and 3.3.2.4.3).

Members of the mammalian genus *Peromyscus* (white-footed mouse and deer mouse in particular) consistently increase in abundance in response to habitat disturbance, while the majority of mammalian species decrease in abundance to varying degrees.

Construction activities will destroy or alter existing habitat, create new habitat, and increase the susceptibility of less mobile animals to direct mortality in the immediate work zones. Proposed activities in or near wetlands have a greater potential for negative impacts to a wider variety of wildlife species than animals occupying adjacent upland sites. However, wetlands are off-limits to military training, thereby avoiding direct negative impacts to those species and the structural integrity of the wetland. Impacts to wetlands are discussed in Section 3.3.1.5.1, but a minor negative impact is expected to wildlife in those wetland sites proposed to be thinned or those in which new crossings will be constructed. The 100 foot buffer surrounding all wetland sites will help protect the wetlands and mitigate some, but not all impacts (Section 3.2.2.2).

Since wildlife habitat and small/big game species are closely tied together, these two categories are discussed together in the preceding alternatives.

<u>Alternative 1</u>: Potential impacts to wildlife are greater in this alternative than for any other, simply due to the size of the area involved. Many resident wildlife (i.e. herons, rail, raccoon, mink, and waterfowl) in affected wetlands will be temporarily displaced to other sites, while the more secretive species (i.e. bobcat) might reduce their use to a greater degree. In terms of positive impacts, the opening of the pine overstory will favor the continued growth of existing mast-producing hardwoods and shrubs, benefitting many game species such as, turkey, rabbit and deer, in addition to a number of non-game mammalian and avian species. The tops of trees, if left after tree removal operations, will provide immediate cover and perching sites for many species. Hunting pressure aside, rabbits and other wildlife may be subjected to higher mortality from vehicular accidents as they attempt to cross the relatively wide corridors and the proposed trails. For edge tolerant species with a high reproductive potential, such as rabbits, any increase in mortality is not expected to negate the expected gains in abundance. White-tailed deer, turkey and rabbits tend to feed most often in open areas near dusk and dawn, and while proposed tracked and vehicular activity will occur during these times, it should occur less often relative to the daylight hours.

Since forest habitat will be cleared and thinned, leaving vast expanses of open areas and edge, this alternative, with regards to both wildlife habitat and small/big game species, has been assigned a value of "–" for the short-term. However, in the long-term, the opening of the pine overstory may favor the continued growth of existing mast-producing hardwoods and

shrubs, benefiting many game and non-game species. With this in mind, a value of "+" has been assigned to this alternative, with regards to long-term effects for both wildlife habitat and small/big game species.

Alternative 2: The removal of timber within the 400 meter maneuver corridors (maximum) connecting PTA 4 to PTA 2, PTA 2 to PTA 1 (Figure 1-11), and the improvement or construction of roads, would have several impacts on wildlife. A change in species diversity could occur as those species not returning would probably be replaced by those preferring an open canopy and/or tolerant of disturbed environments. Since many of the same premises that were based in Alternative 1 are applicable to this alternative, a value of "–" with regards to wildlife and small and big game species has been assigned to this alternative for the short-term, and a value of "+" for the long-term.

Alternative 3A: Many of the general types of impacts discussed for Alternative 1 are also valid for Alternative 3A. However, the number of acres to be cleared and thinned is considerably less than for any of the other action Alternatives (1-3B) (Section 3.3.2.6). With fewer proposed acres to be cleared and thinned, the small/big game species and wildlife habitat will probably remain relatively unchanged. There will, however, still be open areas and edge created, and if woody debris is left after cutting this could possibly increase the amount of wildlife habitat. However, a value of "0" has been attributed to this alternative with respect to wildlife and small and big game species in both the short-term and the long-term, simply due to fewer affected acres.

Alternative 3B: Once again, several impacts that were previously mentioned in Alternatives 1 and 2 are also applicable for Alternative 3B. Alternative 3B involves over 5,000 acres to be cleared, and almost 6,000 acres to be thinned (Section 3.3.2.6). These acres to be cleared and thinned will be distributed among nine corridors and four training areas, creating a great deal of edge (Table 3-29, Section 3.3.2.6). A value of "–" has been given to Alternative 3B with regards to both wildlife habitat and small/big game species for the short-term, since more habitat will be lost than created. With regards to long-term effects, as mentioned previously, the continued growth of mast-producing hardwoods and shrubs will benefit many game and non-game species, and possibly create or improve habitat types. Therefore, a value of "+" has been attributed to this alternative with regards to long-term effects for wildlife and small and big game species.

Alternative 4: Impacts to wildlife would be similar to that which they are at present (described in Section 3.1.2.4). Overall, no net positive or negative impacts to wildlife habitat or small/big game species are expected under this alternative, as discussed in Sections 3.1.2.5 and 3.1.2.6. Therefore, a value of "0" has been attributed to wildlife and small and big game species for both short-term and long-term effects.

Alternative 5: The impacts of these facilities on wildlife are discussed in Section 3.4.4.1. In general, most species will not be impacted in either the short-term or the long-term. Conditions favoring interior and other area-sensitive species may not improve appreciably. Although, as more land is incorporated back into the USFS timber base, portions may be

regenerated, resulting in a continuation of the current rate of fragmentation of the general forest area. The U.S. Forest Service will retain the flexibility to manage habitat from current tank maneuver areas for the benefit of various species. Therefore, a value of "+" has been attributed to this alternative with regards to wildlife and small and big game species for both the short-term and the long-term.

Alternative 6: As previously discussed, even if Camp Shelby were to close, the USFS would still manage for timber production. This could increase the acres of even-aged stand types of similar species and may also increase the amount of open area and edge. Therefore, it is questionable as to what the actual impacts would be if Alternative 6 were implemented. However, a positive net impact on wildlife habitat could nevertheless be expected, but no *increase* in biodiversity is anticipated. All things considered, a value of "+" has been attributed to Alternative 6, with respect to wildlife and small and big game species for both the long-term and the short-term.

4.1.3.1.2 Threatened, Endangered and Sensitive Species

Since the gopher tortoise, red-cockaded woodpecker, eastern indigo snake, and several other species receive special protection under the Endangered Species Act, no overall negative effects to threatened, endangered and sensitive (TE&S) species are expected (Section 3.1.2.6).

The inactive red-cockaded woodpecker (RCW) colony sites and nest trees have been fenced off, posted off-limits, or otherwise marked to reduce disturbance. Gopher Tortoise (GT) burrows and colonies have also been posted as off-limits. Camp Shelby burrowing crawfish is strongly associated with pitcher plant bogs (these areas are off-limits to vehicles and military training) found in a number of areas on Camp Shelby (Appendix E). The combination of this species' dependence on pitcher plant bogs and the military's avoidance of these areas has probably reduced the potential for direct negative impacts to the Camp Shelby population. Other animal species reported for the area, such as the Indigo Snake, occur in such low numbers on Camp Shelby, if at all, that an accurate assessment of the effects of military activities on them cannot be made at this time (Section 3.1.2.5). Section 3.3.2.5.3 discusses the impacts by alternative.

As a result of new information and studies regarding TE&S species at Camp Shelby and elsewhere, biologists are better able to understand what guidelines and/or restrictions should be implemented to insure the continued existence of these species. TE&S species colonies, their habitats, and a buffer zone, along with other military/civilian restrictions, are strictly enforced.

Alternative 1: Under both the 1992 and 1993 Biological Opinions, Alternative 1 could be fully implemented without significant negative impacts to the gopher tortoise. No direct impacts to the RCW are expected unless interim guidelines are not followed. Since TE&S species are protected, no negative impacts are expected to occur in either the long-term or the short-term. Therefore, a value of "0" has been attributed to threatened, endangered and sensitive species for both the short-term and the long-term.

Alternative 2: Under both the 1992 and 1993 Biological Opinions, Alternative 2 could also be fully implemented without significant negative impacts to the gopher tortoise. There will be nearly 4,400 acres of 60-plus year old longleaf pine cleared and a value of "0" has been placed on threatened, endangered and sensitive species for both the short-term and the long-term.

Alternative 3A: Under both the 1992 and 1993 Biological Opinions, Alternative 3A could be fully implemented without significant negative impacts to the gopher tortoise. Few indirect and no direct impacts to the RCW are expected because this alternative contains the fewest RCW colonies and the interim guidelines will also continue to be followed. This alternative has also been assigned a value of "0" for the long-term and short-term with regards to threatened, endangered and sensitive species.

Alternative 3B: Under both the 1992 and 1993 Biological Opinions, Alternative 3B cannot be fully implemented without significant negative impacts to the gopher tortoise. In PTA 6 there is a high concentration of the gopher tortoise (Figure 3-29, Section 3.3.1.3) which makes this alternative unacceptable, therefore a score of – – – has been assigned on this basis. However, with regards to *other* TE&S species, an overall value of "0" would have been assigned to threatened, endangered and sensitive species for both the long-term and the short-term.

Alternative 4: Generally, no negative impacts are expected to TE&S animal species under this alternative. Training will basically continue with current activities and only a few new facilities will be constructed. No new training areas will be implemented in this alternative and a value of "0" has been assigned since the species are already protected.

Alternative 5: Generally, no impacts, positive or negative, are expected to TE&S animal species under this alternative, because as more land is incorporated back into the USFS timber base, a continuation in the current harvest rate may still occur. However, since TE&S species as well as buffer zones established around their populations are protected, some positive benefits may be anticipated for both the short-term and long-term for threatened, endangered and sensitive species.

Alternative 6: Gopher tortoises and the other protected species occurring in the impact area and its buffer zone (Figure 2-1) are now afforded some degree of protection from civilian disturbance for at least a portion of the year, and would likely be subjected to increased human disturbance, resulting from the military relinquishing control over civilian access to this restricted access area. Overall, no significant positive or negative impacts to TE&S animal species are expected under this alternative. However, as mentioned in Alternative 5, a positive benefit may be appropriate since TE&S species and their buffers are protected.

4.1.3.1.3 Biodiversity

Present military activities have the potential to negatively influence biodiversity if the forest is further fragmented, additional permanent edge is created, or keystone species (species

dependent upon by other species) are adversely affected (Section 3.1.2.6). The impact of this community alteration on wildlife species in some cases depends on the age of trees to be removed.

Birds nesting within and adjacent to newly created edge will likely be subjected to greater egg and pre-fledgling predation rates than previously experienced, as avian (i.e. american crow and blue jay), mammalian (i.e. raccoon, coyote, gray and fox squirrels, chipmunk, striped skunk, gray and red foxes), and reptilian (i.e. snakes) predators tend to be especially common in edge habitats. The proposed creation of relatively extensive and permanently cleared/thinned corridors through presently contiguous blocks of forest will undoubtedly increase the potential that a greater proportion (unknown at present) of neotropical migrant nests will be parasitized by the brown-headed cowbird.

As a means to quantitatively differentiate Alternatives 1 through 3B, the amount of open area was calculated (Table 3-28, Section 3.3.2.6). Open land acreage was calculated from Geographic Resources Analysis Support System (GRASS) forest-stand and age-class maps (U.S. Forest Service data) and road maps (MS Army National Guard data) as the sum of grasslands, forest stands less than ten years old, and all roads (a 100 foot buffer centered over every road). Alternatives 4 and 5 will increase these figures slightly as the proposed facilities are constructed, but the amount of open area and edge should remain comparable to that at present.

With Alternatives 1-3B, a number of presently forested tracts will potentially be fragmented by proposed clearing (see Figure 3-22 for example). Fragmenting the forest will have different effects on different species. Wide-ranging mammalian species such as the black bear and bobcat tend to avoid roads and areas of high human disturbance. Most of the identified fragments are not "islands", but are more often proposed to be cleared on three sides. In any case, these semi-isolated forest stands represent a substantial departure from the present state of forest continuity and were thus classified as "fragments" (Section 3.2.2.6).

Alternative 1: Alternative 1 will result in an estimated increase of 1½ times in open area as compared to the present (Table 3-28, Section 3.3.2.6)) and an approximate doubling in edge (Table 3-29, Section 3.3.2.6) from that at present. Potentially, there will be 15 fragments of forest resulting from the clearing of timber for the corridors and within the proposed training areas (PTAs). As a result of fragmenting the forest and increasing the amount of open area and edge, the biodiversity as a whole will be negatively impacted. Several species will benefit from these activities, but most species will possibly be displaced and never return. With all of this in mind, including the large forest tracts of various stand types and ages to be cleared and thinned (Section 3.2.2.6), a value of "–" for the short-term and long-term has been assigned. The reasons why this alternative was negatively classified is that the initial clearing and thinning will eliminate many acres of habitat that are utilized by a vast array of wildlife species. As time passes, edge and grassland species will be moving into the area. However, biodiversity is not seen as improving significantly in the future unless more acres of mature longleaf pine habitat is created.

Alternative 2: Clearing forested areas under Alternative 2 will result in an estimated increase of 1¾ times in open area as compared to the present (Table 3-28, Section 3.3.2.6) and an approximate doubling in edge (Table 3-29, Section 3.3.2.6) compared to the present. Potentially, there could be 14 fragments resulting from the clearing of timber for the corridors and within the PTA's.

Many of the impacts examined in Alternative 1 also pertain to Alternative 2. However, in Alternative 2, although a net decrease in biodiversity can be expected, it would be to a slightly lesser degree than for Alternative 1. This reason for this difference is basically due to the total acres proposed to be cleared and thinned. Alternative 1 is proposed to have over 2,000 more acres cleared than Alternative 2, thus making Alternative 1 less desirable from a biodiversity point of view. Within the parameters of the scale being used, however, this alternative is very similar to Alternative 1 and therefore received a value of "–" for both the short-term and long-term.

Alternative 3A: The land areas involved in this alternative are basically somewhat less diverse in terms of stand types than are the first two alternatives and cover a much smaller area. Alternative 3A will result in an estimated 75% increase in open area (Table 3-28, Section 3.3.2.6) and 67% increase in edge (Table 3-29, Section 3.3.2.6) from that at present. Potentially, at least three fragments of forest will be created from the clearing of timber for the corridors and within the PTA's. Even though there will be an increase in open area and edge as a result of clearing and thinning, a value of "0" (no significant net change) has been assigned for both the short-term and long-term. Since this alternative involves fewer acres to be cleared and thinned, and the areas to be returned to U.S. Forest Service management more nearly balance new areas to be modified, several years down the road the biodiversity of the area should still approximate what it is like at present.

Alternative 3B: Alternative 3B will result in an estimated 42% increase in open area (Table 3-28, Section 3.3.2.6) and 74% increase in edge (Table 3-29, Section 3.3.2.6) from that at present. Potentially, there could be at least 7 fragments of forest created from clearing timber for the corridors and within the PTA's. The classification of "–" has been assigned for both the short-term and long-term due to the proposed increase of edge and open area, in relation to what is already there.

Alternative 4: This alternative is largely a continuation of present activities, and unlike Alternatives 1-3B, greater than normal timber clearing is not proposed. Therefore, the classification of "0" has been assigned to this alternative for both the short-term and the long-term.

Alternative 5: Few significant negative impacts to biodiversity are expected under this alternative, but neither is any improvement anticipated. The increase in cover and foraging and nesting sites should benefit wildlife, especially those species utilizing open pine or edge habitats. With regards to this alternative a value of "+" has been assigned for both the short-term and the long-term. There will, however, be a reduction in open land and the open

understory of the forested maneuver areas. Thus, biodiversity would mirror that of the general forest area on the remainder of the District.

Alternative 6: Under the current Land and Resource Management Plan (LRMP) little increase in biodiversity is expected in spite of the anticipated reduction in off-road wheeled vehicle activity and the cessation of military activities. Optimum biodiversity would be achieved if Camp Shelby contained functional assemblages of flora and fauna that existed in pre-settlement times. This could only be achieved with the establishment and maintenance of some relatively large, contiguous stands of mature (>120 years) longleaf pine. In the absence of military training, it is assumed that the Forest Service would continue to manage the former permit area for multiple use. This may not result in large expanses of older growth longleaf forest representative of pre-settlement times. With this in mind, a value of "+" has assigned to this alternative for both the short-term and the long-term.

4.1.3.1.4 Neotropical Migrants and Other Birds

Information used in assessing impacts were taken from a variety of different sources. Three sources, (Shugart et al., 1978; Hamel et al., 1982; and Peterson, 1980), were used to quantify specific habitat types with respect to the 92 bird species that have been observed at Camp Shelby. Approximately 74% of the birds at Camp Shelby (68 bird species) were observed during the U.S. Army's Land Condition-Trend Analysis bird surveys conducted in Spring of 1991 and 1992. The remaining 24 bird species observed at Camp Shelby were documented by either Weatherford McDade (1990), M. K. Johnson (1987), or R. C. Banks et al., (1987). Neotropical migrants were classified as either class (A) or class (B) based on Partners in Flight (1991).

When habitat types had been assigned to all bird species, the species were then grouped together according to specific habitat types, depending on whether the birds preferred interior, edge, or open areas, if they were neotropical or migrant, and if they were habitat specialists or generalists. After this initial classification, all species were analyzed, individually and as a group, within similar habitat types. The total acres to be cleared and thinned, the amount of edge and open areas created, and size and shape of remaining forest tracts (islands), were also analyzed within each of the seven alternatives. By examining the proposed actions within each alternative and then extrapolating the species' tolerance to certain impacts and their preferred habitat types, we were better able to classify the species with regards to projected impacts among the different alternatives (Table 3-27, Section 3.3.2.4.1).

Alternatives 1 and 2: Alternatives 1 and 2 are biologically considered almost identical, and that is why they were given the same classification (+ or -) with respect to individual bird species (Table 3-27, Section 3.3.2.4.1). These two alternatives will have the largest impacts on species, both positive and negative, simply due to the large number of acres to be cleared and thinned. The edge and open area species will benefit the most while interior species will more than likely be negatively affected (Section 3.3.2.6). The difference between a single (+ or -) and several (+ or -) reflects the species' tolerance to different actions proposed within the alternatives, whether they are edge or interior species, etc. There were a number of

factors that were looked at in order to better approximate the different impacts associated with each species. In all of the Alternatives (1-6), those species associated with wetlands will generally be unaffected. The reason for this classification, no effect, is that the wetlands, except for a few wetland crossings, will be left unchanged. A value of (- -) has been assigned with regards to both alternatives for the short-term and a value of (-) for the long-term. The difference for these values is that the initial clearing of trees will more severely impact the bird species in the short-term, and as times goes by, different species may come in and utilize the areas more efficiently, but will not approximate pre-cutting conditions.

Alternatives 3A and 3B: These alternatives are also somewhat similar, with 3B exhibiting slightly higher scores in some instances. This difference is because 3B is proposed to have approximately 750 more acres cleared, and 3,275 more acres thinned than Alternative 3A. Once again, individual species as well as species with similar habitat preferences were examined and assigned values (+ or -) depending upon many of the previous premises mentioned above. Overall, both alternatives were assigned a value of (-) for the short-term and a value of (0) for the long-term. The negative values for the short-term are in reference to the initial clearing and thinning of trees which will negatively impact several species. The value of (0) for the long-term was assigned because over the years species will begin utilizing the habitats more effectively and the areas involved were much smaller than Alternatives 1 and 2.

Alternatives 4 and 5: Alternatives 4 and 5 do not propose reconfiguring maneuver training areas and the current use of lands in Alternative 4 would not change. With this in mind, for the most part, no positive or negative impacts are expected under this alternative, resulting in a value of (0) for both the short- and long-term. The Mississippi kite may be expected to increase in Alternative 5 due to this species' preference for woody streams (bottomland hardwoods), which will be left undisturbed for the most part. Under Alternative 5, lands will remain relatively unchanged, even though several new facilities would be constructed. Conditions favoring interior and other area-sensitive species are not expected to improve appreciably as more land is incorporated back into the U.S. Forest Service (USFS) timber base and managed similarly to the other units on the forest, resulting in a continuation in the current rate of fragmentation (Section 3.3.2.6). A few species that prefer forest interior (i.e. pine warbler, pileated woodpecker, Red-bellied woodpecker, Carolina chickadee, etc.) may benefit with this alternative and are therefore assigned a value of "+". Overall, a value of (+) has been assigned with regards to Alternative 5 for the short-term, and a value of (++) for the long-term, as tracked vehicle areas begin to revegetate.

Alternative 6: This alternative, if implemented, would return most land to management for multiple use by the USFS. This would involve varying degrees of timber harvest. A value of (+) has been assigned for the short-term, and a value of (++) for the long-term. These values were derived from the fact that by closing the post, current military activities cease, causing less noise disturbance, less bird/man interactions, and benefiting overall habitat, especially for forest interior species.

4.1.3.1.5 Quality of Life

With current mitigation actions (Section 3.2.4) in place, no change in the overall quality of life is anticipated under any alternative. In areas adjacent to the Special Use Permit (SUP) boundary for proposed training areas (PTAs) 1, 2, and 3 (with Alternative 1) or for PTAs 1, 2, and 4 (with Alternative 2) some annoyance may be experienced during Annual Training from the proposed military training activities. Alternatives 3A and 3B are anticipated to have minor negative effect on the quality of life (QOL) of residents due to the location of PTAs 5 and 6 west of Highway 29 and due to the proximity of PTA 5 to town of Mahned and PTA 6 being close to Paret Tower and nearby residences. With Alternative 4, no change is anticipated since current level of military training activities would be maintained. There will be a positive affect on the QOL from Alternative 5 since off-road access by tanks would be excluded. Alternative 6 would have a more positive affect on the QOL since military training activities would be discontinued.

Quality of life of residents who live within or immediately adjacent to the SUP boundary and in towns along Highways 98, 57, and 29 would be more severely affected if there were no mitigation measures in place. There are also several camp sites, church buildings, and schools in the vicinity. There are, however, several mitigation measures in place to minimize these effects. Current mitigation practices are described in Section 3.2.4. With the continuation of current mitigation actions, no overall change is anticipated in the QOL from the proposed actions. Under the present activities, some military training is conducted east of Highway 29, and does have a negative affect on the QOL of residents nearby. Under the proposed activities, for Alternatives 3A and 3B, maneuver training is proposed to take place only west of Highway 29, thereby having some negative effects on residents along Highway 98.

<u>Outdoor Recreation</u>: Increased access is equated to more opportunity for some types of recreation. In the long and short term, Alternatives 1 and 2 may have a positive effect on some types of recreation because of the increased access from new roads and trails into the proposed maneuver areas. Alternatives 3A and 3B would provide somewhat less potential benefit because they incorporate currently extensive cleared areas. There would be no change in effect under Alternative 5. Alternative 6 would have a small positive effect on accessibility as a result of opening safety fan areas that are closed during portions of annual and weekend training periods.

Because of the increased land area in proposed maneuver corridor sets which are included in Alternatives 1, 2, 3A, and 3B, these alternatives may increase the potential for military-civilian interaction. In addition, implementation of 3A or 3B would also involve more frequent periodic delays of passage on Highway 29. Execution of Alternatives 3A or 3B would severely limit siting of recreational (equestrian or ATV or all terrain vehicle) trails in those areas proposed for training use. These effects would occur over both the long and short term. Refer to Section 3.3.3.4 for an assessment of impacts on recreational use of the Camp Shelby area.

Noise Environment:

Impulse Noise -- No changes are proposed which would significantly affect the generation of military training-related noise, particularly the impulse noise generated by the Army National Guard, at Camp Shelby. Overall, several facilities projects propose to move the locations of small arms ranges somewhat, but their contribution to the noise environment is negligible. The construction of Automated Tank Table VIII and the Multipurpose Range Complex (Heavy) will not create new weapons usage. Both sites are now the location of tank gunnery ranges, and the total number of rounds fired on the new ranges will be approximately equal to the total used on the old ranges. Those 10 to 12 residences which are most directly affected, as well as the 20 to 30 other properties nearest to the impact area will experience neither degradation nor improvement in their situation relating to heavy weapons.

Aircraft Noise -- No changes are projected in the numbers of Army National Guard helicopters, or in the flight hours for each unit. Development of the Tactical Aviation Areas will tend to "regularize" the locations where the aviation units group in the field for bivouac and operations purposes. None of these locations is within the "annoyance" distance from occupied residences. Flights will continue along the Nap of the Earth routes, and the four residences within the "annoyance" distance from these routes will continue to be affected occasionally as these routes are used. Flights throughout the Camp Shelby area will continue to take place during training activities, and some nearby residents will continue to be aware of these operations and consider them an annoyance.

Air National Guard jet aircraft will continue to use the air-to-ground ranges on Camp Shelby from approximately 2,000 to 2,800 times per year. While the noise levels created by these aircraft will continue have the potential to be high in one rural residential area just south of the permit area, and an occasional to regular annoyance in other areas, implementation of the revised return to target flight pattern for Air National Guard jet aircraft in June 1993 should allow the residents in this area to experience a slightly reduced level of annoyance from aircraft operations. This is anticipated to represent the future situation.

Vehicle Noise -- Tanks, trucks and other ground vehicles will continue to operate on tank trails and other authorized travel routes approximately as in the past. The vehicle noises associated with their passage will continue to be heard by some residents, and some annoyance will continue. No significant increase in this noise will take place, however. Field maneuvers would, under Alternatives 1 and 2, take place in some areas in which they are not now experienced. Some residents living on FS 307 and FS 309 south of Oak Grove will hear vehicles during field maneuvers more frequently than is now experienced.

Traffic Interruption -- The effects of different alternatives are somewhat similar, but would be experienced in two different areas. Alternatives 1 and 2 would use PTAs 1 and 2, in the southeastern part of the permit area. Under these alternatives, traffic delays on Highway 29 would be about as frequent as at present, but the need to cross FS 303 (Eight-Mile Road) would be more frequent than at present, and delays also would increase. Under Alternative 3A, the need to cross Highway 29 north of FS 303 would be more frequent, and delays in the

flow of north-south traffic would also be more frequent. No convoy traffic would cross FS 303 under this alternative, since no maneuver use would take place south of that road.

4.1.3.1.6 Regional Economy and Economic Environment

Employment: No effect on employment under the Alternatives 1, 2, 3A, 3B, or 4 is anticipated in the short or long term. Employment in a major regional enterprise, the forest products industry, is projected to decline consistently over the years from 1990 to 2035 (Obers projections, Appendix M, Section D). Since Camp Shelby is a stable source of employment in the region, under the current level of activities it will become relatively more important to the regional economy. Although the number of jobs potentially lost has not been specifically determined, implementation of Alternative 5 would reduce employment at Camp Shelby, a negative result in the short term. Alternative 6 would have a greater negative effect. This effect would occur upon closure of Camp Shelby and would continue through the 10 year outlook. National Guard employees would be expected to have the opportunity to transfer their employment to other locations. Refer to Sections 3.3.3.2 and 3.3.4.1 for a discussion of influences on employment in the region.

Regional Economy -- Results of the Economic Impact Forecast System (EIFS) analysis show that Camp Shelby has a positive effect on the five county regional economy (Table 3-10). No change in influence on the regional economy is anticipated from execution of Alternatives 1, 2, 3A, 3B, or 4. In the long term Alternative 5 likely will have a negative effect on the economy as a result of reduced operations at the installation. Reduced operations would result in fewer supplies and services required of local establishments by Camp Shelby. Alternative 6 would have an immediate negative impact on the regional economy due to lost employment opportunities at Camp Shelby and in businesses providing services and supplies to the installation. These impacts are apt to continue to be felt through the 10 year horizon. Refer to Section 3.3.4.1 for a discussion of consequences for the regional economy.

Mineral Extraction -- The significance of the different alternatives is dependent on the acreages utilized for military training and is the same in the short and long term. Implementation of the different alternatives would affect different amounts of acres under mineral rights leases, and therefore, access to work sites. With Alternatives 1, 2, 3A, 3B, 4, and 5 Military Use Special Stipulations for the Camp Shelby Training Area will continue to be incorporated in standard leases. Mineral exploration and extraction are expected to continue as currently carried out. With Alternative 6, the Military Use Special Stipulations would not be necessary, resulting in a slightly favorable effect. Refer to Section 3.3.4.2 for a survey of effects on mineral extraction.

4.1.3.1.7 Timber Harvest and the Timber Industry

Short term effects show little appreciable difference among the action alternatives (Alternatives 1, 2, 3A, and 3B). See Table 3-25. This is due to the availability of the timber volume reentering Forest Service management from the (current) tracked vehicle maneuver areas as well as the intentional deferring of other timber sales volume during the

implementation (i.e. clearing and thinning) of Alternatives 1 or 2. This deferred volume allows harvest levels to stay relatively even, at approximately 1991 levels, through the first 30 years. Because the acreages involved are approximately equal, Alternative 3B allows almost as much timber to come to market from returned tracked vehicle areas as is lost due to new maneuver areas and corridors. Alternative 3A returns *more* timber to management than is used to construct new maneuver areas (see Tables 3-23 and 3-25). As the returned tracked vehicle areas are evaluated for silvicultural needs and resultant timber sales, the amount of timber coming to market will show modest increases over current levels for Alternatives 3A and 5. In Alternative 6, all areas except the impact area will come under regular National Forest management. An increase averaging about 4 MMBF per year would be seen in timber sales during the first 10 year period.

The long term effects are somewhat different. They depend, in turn, on the net effect of each of the alternatives on the managed timber land base (see Table 3-24). Alternatives 1 and 2 will result in reductions of about 2 MMBF annually during the fourth period (i.e. from 2020 through 2029). These reductions will increase slightly thereafter until long term sustained yield is reached throughout the permit area. The effects of Alternative 3B are similar to the short term effects because of the similarity in returned and new tracked vehicle maneuver area. Alternatives 3A, 5, and 6 have increasingly significant volume increases until long term sustained yield is reached.

4.1.3.1.8 Soil Damage

Soil disturbance is inevitable during the implementation and construction phases of Alternatives 1 through 3B, the extent depending on the acres involved and the intensity of use planned (see Section 3.3.1.3).

<u>Alternatives 1-3B</u>: Double negative scores were assigned, to both Alternatives 1 and 2, Alternative 3A received a single negative score and Alternative 3B received a triple negative score (Table 4-1). Alternative 3A makes the greatest use of existing tracked vehicle maneuver areas, the least use of areas presently not used for tracked vehicles (see Table 3-24, Section 3.3.2.3.1) and proposes the least amount of area to be used for training or tracked vehicles (see Table 1-3). Alternatives 1 and 2 propose the greatest use of areas presently not used for tracked vehicles (see Table 3-24, Section 3.3.2.3.1) and propose the greatest total amount of area to be used for training or tracked vehicles (see Table 1-3). However, Alternative 3B will receive the greatest intensity of use on the acres available for tracked vehicle maneuvering within the proposed training areas and because of the constraint of developing this alternative north and west of 303 guidelines to minimize use of areas with environmental constraints could not be strictly adhered to.

<u>Alternative 4</u>: Alternative 4 proposes the status-quo with the exception of some new facilities, therefore, with current and proposed mitigation (i.e. use of the decision matrix, see Sections 3.3.2, 3.3.3, 3.4.3.1 and 3.4.4), a positive net change is anticipated from the current status of the soils on Camp Shelby.

Alternatives 5 and 6: Alternatives 5 and 6 propose substantial acreage be turned back to National Forest management practices (see Table 3-24, Section 3.3.2.3.1), reducing relative soil disturbance compared to the current status thus, positive scores were assigned for the short term (Table 4-1).

On a long term basis, after initial disturbance is mitigated and long term, routine use of the areas involved under each alternative is set, soil disturbance will be moderated by improved mitigation procedures (see Section 3.4.5 and 3.4.6) and the deviation from the current status under each alternative is anticipated to be less (Table 4-2).

4.1.3.1.9 Soil Erosion/Deposition

Soil erosion and deposition were estimated using a sophisticated model. Several scenarios were analyzed including current status, proposed status and cumulative effects all based on proposed training area (PTA) 1. The following discussion is based on this analysis and can be referred to in Sections 3.1.1.3.4, 3.3.1.4 and 3.4.2 respectively.

Alternatives 1, 2, 3A and 3B: Although soil disturbance may be measurable during the implementation phase of Alternatives 1 through 3B, soil erosion and soil deposition into critical areas or off site will be minimized by preconstruction mitigation measures (see Sections 3.4.4.1, 3.4.5.2 and 3.4.5.4). Alternatives 1 and 2 were assigned double negatives because they propose the greatest amount of area to be effected by clearing and thinning and subsequent training. Alternative 3A was assigned a single negative because it proposes the least amount of area to be affected. Alternative 3B was assigned a double negative even though an intermediate amount of area will be affected. Because of the constraint of developing this alternative north and west of FS Road 303, guidelines to minimize use of areas with environmental constraints, such as soils with high erosion potentials, could not be strictly adhered to (Table 4-1).

Alternative 4: If Alternative 4 were implemented, soil loss would be expected to decrease relative to current soil loss because of the increased commitment to mitigation procedures (i.e. use of the decision matrix, see Sections 3.3.2, 3.3.3, 3.4.3.1 and 3.4.4), a positive net change is anticipated from the current status of the soils on Camp Shelby.

Alternatives 5 and 6: Alternatives 5 and 6 propose substantial acreage be turned back to National Forest management practices (see Table 3-24, Section 3.3.2.3.1), reducing relative soil disturbance and resulting erosion/deposition compared to the current status thus, positive scores were assigned for the short term (Table 4-1).

On a long term basis, after initial disturbance is mitigated and long term, routine use of the areas involved under each alternative is set, soil disturbance and subsequent erosion/deposition will be moderated by improved mitigation procedures (see Section 3.4.6) and the deviation from the current status under each alternative is anticipated to be less (Table 4-2).

4.1.3.1.10 Surface Water Quality

Surface water quality would be expected to follow the same pattern as soil erosion and deposition, both short and long term (Tables 4-1 and 4-2).

Alternatives 1-3B: Surface water quality is directly related to soil damage, erosion/deposition and the mitigation procedures effected to prevent soil disturbance and water quality degradation (see Sections 3.4.1 through 3.4.6). Therefore, the same scores were assigned each alternative for water quality as were assigned for soil damage and erosion deposition.

Alternative 4: If Alternative 4 were implemented, soil loss would be expected to decrease relative to current soil loss because of the increased commitment to mitigation procedures (i.e. use of the decision matrix, see Sections 3.3.2, 3.3.3, 3.4.3.1 and 3.4.4), a positive net change is anticipated in water quality relative to current status.

Alternatives 5 and 6: Alternatives 5 and 6 propose substantial acreage be turned back to National Forest management practices (see Table 3-24, Section 3.2.2.3.1), reducing relative soil disturbance and resulting erosion/deposition compared to the current status thus, positive scores were assigned for water quality (Table 4-1).

On a long term basis, after initial disturbance is mitigated and long term, routine use of the areas involved under each alternative is set, soil disturbance and subsequent erosion/deposition will be moderated by improved mitigation procedures (see section 3.4.6). Therefore, water quality should improve and the deviation from the current status under each alternative is anticipated to be less (Table 4-2).

4.1.3.1.11 Wetland Integrity

Wetland integrity is directly related to soil erosion/deposition and water quality and therefore, the scores follow similar patterns as those, both long and short term (Tables 4-1 and 4-2).

Alternatives 1, 2, 3A & 3B: Wetland integrity is directly related to soil damage, erosion/deposition and the mitigation procedures effected to prevent soil disturbance and water quality degradation (see sections 3.4.1 through 3.4.6). Therefore, the scores assigned Alternatives 1-3B follow similar patterns as those for water quality, soil damage and erosion/deposition but are less negative because mitigation measures will prevent most sediment from reaching the wetlands.

Alternative 4: If Alternative 4 were implemented, increased commitment to mitigation procedures should have a positive effect on wetland integrity (i.e. use of the decision matrix, see Sections 3.3.2, 3.3.3, 3.4.3.1 and 3.4.4), a positive net change is anticipated in wetland integrity relative to current status.

Alternatives 5 and 6: Alternatives 5 and 6 propose substantial acreage be turned back to National Forest management practices (see Table 3-24, Section 3.3.2.3.1), reducing relative

soil disturbance and resulting erosion/deposition compared to the current status thus, positive scores were assigned for wetland integrity (Table 4-1).

On a long term basis, after initial disturbance is mitigated and long term, routine use of the areas involved under each alternative is set, soil disturbance and subsequent erosion/deposition will be moderated by improved mitigation procedures (see Section 3.4.6). Therefore, wetland integrity should improve and the deviation from the current status under each alternative is anticipated to be less (Table 4-2).

4.1.3.1.12 Wetland (Loss)

Wetland loss must be mitigated and several measures are available to compensate for any loss. These measures are discussed in detail in Section 3.4.5.6.

<u>Alternatives 1-3B</u>: Wetland loss anticipated under Alternatives 1 through 3B is calculated to be a maximum of 91 acres. By implementing one or a combination of the wetland mitigation techniques discussed in Section 3.4.5.6, impacts from wetland loss can be minimized.

<u>Alternative 4</u>: Improved mitigation procedures will prevent further wetland losses. Those currently lost will not be mitigated. Therefore, a positive score was assigned to Alternative 4.

<u>Alternatives 5 and 6</u>: Acres returned to forest management practice under Alternatives 5 and 6 will also have a positive effect as compared to the current status because no further wetland loss will occur.

Scores assigned to wetland loss on a long term basis were the same as for the short term because any positive or negative effect can be realized within 10 years.

4.1.3.1.13 Ground Cover

Ground cover includes both herbaceous and woody plant cover that is effective in protecting the soil from direct impact of precipitation and erosion. Herbaceous cover alone, once established can adequately protect the soil resource.

<u>Alternatives 1-3B</u>: Ground cover will initially be negatively affected during the implementation and construction phases of Alternatives 1, 2 and 3B. However, Alternative 3A makes the greatest use of existing tracked vehicle areas, therefore, Alternative 3A will cause no net change compared to the current status (Table 4-1).

<u>Alternative 4</u>: Proposed mitigation measures will improve ground cover if Alternative 4 is implemented, relative to the current status. Therefore, this alternative was given a single positive score.

Alternatives 5 and 6: Ground cover will also improve compared to the current status if Alternative 5 or 6 is implemented. This will result because much of the area now used for training will revert back to U.S. Forest Service management (see Section 3.3.2.3.1.)

On a long term basis the ground cover under Alternatives 1 through 4 will be managed as open herbaceous areas, and with proposed mitigation procedures (see Sections 3.4.1 through 3.4.4), only small changes from the current status are expected for Alternatives 3A, 3B and 4. Net change in ground cover will be positive for Alternatives 5 and 6 (Table 4-2).

4.1.3.2 Military Training Capability

The alternatives differ markedly in the degree to which they are able to meet the military training mission needs of the U.S. Army and the Mississippi National Guard.

Alternative 1: As summarized in Table 4-1, Alternative 1 would provide, by far, the greatest improvement in training capability in the AirLand battle concept for those armor and mechanized units for which Camp Shelby is the mobilization station and the annual training site. In addition to the increased maneuver capability, all of which is outside the tank main gun safety closure area, the construction of the several training facilities will add significantly to the training capability of Camp Shelby.

Alternatives 2 and 3A: These alternatives would provide a training configuration somewhat improved over the present situation, although not able to provide AirLand battle maneuver training to full battalions, an important part of the mission requirement. All maneuver area is, however, outside the tank main gun safety closure area, a significant improvement over the present. Again, construction of the additional training facilities would improve the overall capability of Camp Shelby to support the units stationed there.

Alternative 3B: Alternative 3B would provide only minimal increase in training capability over Alternative 3A, and no increase in maneuver area outside the tank main gun safety closure area. Conflicts with the threatened gopher tortoise, numerous stream channels and associated wetlands, and other environmental restrictions serve to allow only limited development of maneuver area within the added acreage of the study area.

Alternative 4: Alternative 4 would not provide an improved maneuver configuration, and a significant part of the approved maneuver area is within the tank main gun safety closure area. This decreases training capability, and requires additional training days for tank crews to qualify in tank gunnery. The addition of several new training facilities slightly increases the overall capability of Camp Shelby to support its mission needs.

Alternative 5: Alternative 5 would provide armor and mechanized units with only the gunnery part of their training needs. A wide variety of field training needs would have to be met elsewhere, or the units might be moved or disestablished. No training facilities would be added, and the overall capability of Camp Shelby would be seriously diminished even if it were to continue to operate.

Alternative 6: Alternative 6 would result in closure of Camp Shelby. In the absence of any Special Use Permit, neither gunnery nor field maneuvers would be possible. The Mississippi National Guard cannot identify a mission for an installation that does not offer gunnery and maneuver training in addition to those smaller locations which also lack such capability.

4.2 Recommendations

4.2.1 Biodiversity

The following considerations are recommended when implementing any action alternative in order to reduce impacts to local biodiversity:

- Cut timber over a 3-5 year or longer period. By cutting over prolonged periods of time, many species will be better able to adapt to the changing environment. Many resident species will still become displaced (Section 3.3.2.6), but the stress and competition for food and habitat will be spread out over longer periods, perhaps decreasing the impacts associated from cutting.

- Avoid cutting timber (Alternative 1-3A) during the nesting season if possible. Many of the neotropical bird species, and resident species as well, may be negatively affected if cutting occurred during these critical periods (1 May - 30 August). For raptor and most likely all birds, the nest building and egg laying phases are probably the periods in which they are most sensitive to noise disturbance (Section 3.1.5.4). Disturbance to nesting birds has the potential to result in nest abandonment, inadequately incubated eggs, resulting in death of the embryo, or hatchlings being startled and prematurely jumping from their nest. Since most species have slightly different nesting seasons, care must be implemented to insure the fewest bird species, or at least sensitive species, are not disturbed during these nesting periods.

- Leave existing snags (standing dead trees) in areas to be cleared and thinned, and create snags in thinned and no action areas, particularly in sites adjacent to cleared and thinned areas, to achieve the U. S. Forest Service (USFS) guideline of at least two per acre. As mentioned in Section 3.3.2.4, snags and down woody debris are heavily utilized by an array of birds, mammals, amphibians, reptiles, and invertebrates to satisfy a variety of needs, and are now accepted as an integral part of the forest ecosystem. The red-headed woodpecker, red-bellied woodpecker, wood duck, screech owl, common flicker, downy woodpecker, great-crested flycatcher, tufted titmouse, white-breasted nuthatch, and brown creeper are just a few snag-associated species (Section 3.3.2.6).

- Leave some downed trees and other woody debris from the clearing and thinning operations on the ground when possible. As mentioned above, woody debris and downed trees provide habitat and a food source for a wide range of species (Section 3.3.2.4). The woody debris will provide cover and perching sites in the short term, and as the debris begins to break down it should attract a greater variety of invertebrate and vertebrate species.

- Leave remaining forested stands connected by unthinned strips of forest as wide as possible. By leaving these connected woody corridors it may help minimize forest fragmentation and provide adequate avenues of dispersal for many woodland species (Section 3.3.2.4).

- Any fragments (cut on three or more sides) left as a result of PTA or corridor construction should be as large as possible. By leaving larger forest fragments, some of the forest interior species may not be as adversely affected. Many of the smaller fragments may perhaps be considered all "edge" due to the shape and size, and depending on how dense the fragments are.

- Consider allowing T-44, the Ragland Hills Natural Area, or other managed stands within the permit area to attain old-growth status. Old-growth forests are often utilized by many species of birds and other wildlife, and will add to the biodiversity of the region.

- One way to increase biodiversity is to have relatively large stands of several age classes (Section 3.3.2.6). Longleaf pine stand types that are allowed to mature to ages over 100-plus years and then linked together, may better represent pre-settlement conditions, thus benefitting certain species of particular interest, primarily the red-cockaded woodpecker.

- Continue monitoring neotropical migrant species on the Land Condition-Trend Analysis study plots on an annual basis. By studying bird population trends over several years, species can be analyzed to see what effects the impacts have had on their status. Through this type of monitoring, if species begin to show signs of stress or population declines, action can be taken to help alleviate these problems before they get out of hand.

- Monitor brown-headed cowbird populations and consider initiating a cowbird reduction program if nest parasitism appears to be excessive. The creation of edge corridors through contiguous tracts of forest has allowed the brown-headed cowbird and the blue jay to expand their distributions at the expense of other species (Section 3.1.2.6).

- Initiate an aquatic (macroinvertebrate) monitoring schedule and adjust soil erosion or other mitigation procedures/methods if needed. The reasons behind initiating an aquatic monitoring program is to at first get baseline data with regards to what is present, and to see if any threatened, endangered, or sensitive species exist. Then, by monitoring these same areas over successive years, any changes in species composition or population levels would suggest that something is affecting the area in question and appropriate measures to mitigate the effects could be implemented. Soil erosion is another problem that may lead to siltation and may cause severe consequences to the plants and animals in the area.

- Closely monitor fertilizer levels/application in areas encompassing or in close proximity to pitcher plant bogs. An increase in nitrogen, such as the application of fertilizer in a mitigation program, could allow invading plant species to become established in these areas when they would not have otherwise. Not only would this negatively effect the pitcher plants, but would also change the species composition of the community. Fertilizer

should be closely monitored to ensure that nitrogen and other nutrients are not running off into wetland areas (Section 3.1.2.6). Fertilizer use models such as that used in the calculations for this EIS (Appendix S) would be of value. Pitcher plant bogs are extremely important to numerous plants and animals, including the endemic Camp Shelby burrowing crayfish, a proposed federal (candidate) species.

- Develop long-term research projects to assess gopher tortoise reproductive success, movement patterns, and mortality. Gopher tortoise colonies and burrows should continue to be monitored to insure that no negative effects result from military, civilian, or USFS activities. Movement patterns should be recorded to see where the tortoises are and how far they have traveled. Mortality and reproductive rates should also be monitored to see how well the populations are doing. If many mortalities are caused by a particular source or in a certain area, new guidelines may have to be implemented to ensure the safety of the gopher tortoise.

4.3 Preferred Alternative

Environmentally Preferred Alternative: Based on the conclusions above, the alternatives ranked from highest to lowest in terms of preference solely from an environmental perspective are; 6 -- 5 -- 4 -- 3A -- 1 and 2 (not significantly different), followed by 3B, which cannot legally be implemented due to adverse impacts to the gopher tortoise, a threatened species. Those alternatives which best meet the mission needs will require the most numerous changes to the present environment. This is not uncommon when proposing major projects.

Of those alternatives which meet all or most mission requirements, either Alternative 1 or Alternative 2 may be accomplished within acceptable environmental constraints. Of the alternatives which allow at least maintenance of present capability, Alternative 4, with additional environmental exclusion areas within maneuver areas, is clearly the best from an environmental point of view. The several places where improvement is anticipated (with a score of "+" in Tables 4-1 and 4-2) are a result of the programmed implementation of Integrated Training Area Management (ITAM_ and other improved land management procedures at Camp Shelby regardless of which of the alternatives which include continued training are selected.

Alternative Which Will Best Meet Mission Requirements: In considering all aspects of the environment and the degree to which each alternative meets the needs of the National Guard mission for Camp Shelby, only Alternative 1 will meet all or a majority of the full training needs. In the absence of a capability to implement Alternative 1 for any reason, either Alternative 3A or Alternative 4 will provide somewhat enhanced training capability over the present, combined with a smaller need to plan and manage new training lands. Alternative 2 would require almost as much development cost and result in almost as much need for environmental mitigation measures as would Alternative 1, with only a small improvement in training capability. Alternative 3B cannot be implemented because of the likelihood of damage to the gopher tortoise, and would not provide markedly superior capability over

Alternative 3A. Alternatives 5 and 6 would fail to meet even the present capabilities of Camp Shelby. If either is selected, the training activities would diminish rapidly. Under Alternative 6, all firing and field maneuver would stop with the expiration of the existing, extended special use permit. Under Alternative 5, firing range activity is possible for some time, but the Army training community would find unsatisfactory the need to maneuver at a location other than the location where firing takes place. Under each alternative, the training facilities projects associated with it form an integral part of the preferred alternative. The ranking of alterntives based solely on mission requirements is thus 1 -- 2 -- 3A -- 4 -- 5 -- 6. If Alternative 3B were allowable, and did not have the severe limitations based on the threatened gopher tortoise, it would be placed slightly above 3A.

<u>Preferred Alternative on Overall Basis</u>: Considering all elements, including added training capability, necessity to manage and maintain the environment, and the costs of implementation, the proponent's preferred alternative is Alterative 1. Alternative 2 has fewer training benefits and almost equal environmental consequences, and is viewed as less desirable. Alternative 3A would provide capability approximately equal to, or slightly better than, the present, and utilizes many of the present maneuver areas. Alternative 4, with the implementation of the training facilities proposed, would somewhat improve range firing capability while retaining almost the same maneuver as at present. The application of additional environmental mitigation measures to the current maneuver areas will reduce usable acreage somewhat. Neither Alternative 5 nor 6 is considered acceptable.

Final
Environmental Impact Statement

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Chapter 5

BIBLIOGRAPHY

CHAPTER 5.0 BIBLIOGRAPHY

This Bibliography is organized into three sections for easier referencing:

General technical reports and other citations (nonspecific to Shelby) are located in the general bibliography.

Allan, J.D., and A.S. Flecker, 1993. "Biodiversity Conservation in Running Waters," *BioScience*, vol 43, pp 32-43.

Ames, P.L., and G.S. Mersereau, 1964. "Some Factors in the Decline of the Osprey in Connecticut," *Auk,* vol, 81 pp 173-185.

Anderson, D.E., 1984. *Military Training and the Ecology of Raptor Populations at Fort Carson, Colorado*. Thesis (University of Wisconsin-Madison) p 142.

Aspin, 1993. *Army Guard and Reserve Restructuring Planned*, Press Release (Office of Secretary of Defense, Public Affairs, Washington, D.C., December 10).

Atkenson, T. D., and A. S. Johnson, 1979. "Succession of Small Mammals on Pine Plantations in the Georgia Piedmont," *American Midland Naturalist*, vol 101, pp 385-392.

Austin, O.L., Jr., W.B. Robertson, Jr., and G.E. Woolfenden, 1970. Mass Hatching Failure in Dry Tortugas Sooty Turns (Sterna fuscata) K.H. Voous, ed., *Proceedings: 15th International Ornithological Congress* (The Hague, Netherlands) p 627.

Awbrey, F.T., and A.E. Bowles. 1990. *The Effects of Aircraft Noise and Sonic Booms on Raptors*. NSBIT Technical Operating Report No. 12 (Sea World Research Institute, Hubbs Marine Research Center, San Diego).

Banks, R. C., R. W. McDiarmid, and A. L. Gardner, 1987. *Checklist of Vertebrates of the United States, the U.S. Territories, and Canada*, Resource Publication 166 Biloxi Ranger District De Soto National Forest Standards and Guidelines from the Forest Plan for National Forests in Mississippi (U.S. Fish and Wildlife Service) pp 79.

Barfield, B.J., R.C. Warner and C.T. Hann, 1981. *Applied Hydrology and Sedimentology for Disturbed Area* (Oklahoma Technical Press, Stillwater, OK).

Baver, L. D., W. H. Gardener, and W. R. Gardener eds., 1972. *Soil Physics* (John Wiley and Sons, Inc.) pp 454.

Biennial Report of the State Game and Fish Commission to the Mississippi Legislature, Oct. 1, 1933- Sept. 30, 1935; Oct. 1,1937- June 30, 1939; July 1, 1941- June 30, 1943; July 1, 1947- June 30, 1947.

Birkeland, P.W., 1984. *Soils and Geomorphology* (Oxford University Press, New York).

Blake, J.G., and J.R. Karr, 1984. "Species Composition of Bird Communities and the Conservation Benefit of Large Versus Small Forests," *Biological Conservation,* vol 30 pp 173-187.

Boeker, E.L., and T.D. Ray, 1971. "Golden Eagle Population Studies in the Southwest," *Condor,* vol 73, pp 463-467.

Bondello, M.C., 1976. *The Effects of High-Intensity Motorcycle Sounds on the Acoustical Sensitivity of the Desert Iguana,* Diposaurus dorsalis. M.A. Thesis (Biology Dept., California State University, Fullerton) pp 37.

Boyer, W.D. and J.B. White, 1989. *Proceedings of Symposium on Management of Longleaf Pine* (Long Beach, MS, April 4-6).

Brattstrom, B.H., and M.C. Bondello, 1983. "Effects of Off-Road Vehicle Noise on Desert Vertebrates," R.H. Webb and H.G. Wilshore, eds. *Environmental Effects of Off-Road Vehicles: Impacts and Management in Arid Regions* (Springer-Verlag, New York) pp 167-206.

Brittingham, M.C., and S.A. Temple, 1983. "Have Cowbirds Caused Forest Songbirds to Decline?" *BioScience*, vol 33, pp 31-35.

Burroughs, E.R. and J.G. King, 1989. *Reduction of Soil Erosion on Forest Roads,* General Technical Report INT-264 (U.S Department of Agriculture [USDA] Forest Service, Intermountain Research Station, Ogden, UT).

Cain, C.E., 1953. "The Land and the Indians," *Four Centuries on the Pascagoula River, Volume I: History, Story, and Legend of the Pascagoula River Country, George and Jackson Counties.*

Christensen, N.L., 1981. *Proceedings: Fire Regimes and Ecosystem Properties Conference,* Technical Report WO-26, "Fire Regimes in Southeastern Forests," (U.S. Department of Agriculture [USDA], Honolulu, Hawaii, December 1981).

Clairborne, J.F.H., 1841. "A Trip Through the Piney Woods," Riley, F.L., ed., *Publications of the Mississippi Historical Society* (1906) vol 9.

Cook, F.A. 1962. *Snakes of Mississippi*. Mississippi Game and Fish Commission Survey, 1954 Bulletin, revised, pp 44.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe, 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. (Office of Biological Services, Fish and Wildlife Service, U.S. Department of the Interior, Washington D.C.).

Croker, T.C. and W.D. Boyer, 1975. *Regenerating Longleaf Pine Naturally*, U.S. Forest Service Research [USFS] SO-105.

Davis, J.W., 1983., G.A. Goodwin, and R.A. Ockenfels, technical coordinators. "Snags are for Wildlife," *Snag Habitat Management: Proceedings of a Symposium*, U.S. Department of Agriculture [USDA] Forest Service General Technical Report RM-99, (Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO) vol 226, pp 4-9.

Davis, M.B. and C. Zabinski. 1992. "Changes in Geographical Range Resulting from Greenhouse Warming: Effects on Biodiversity in Forests," in: Peters, R.L. and T.E. Lovejoy, editors, *Global Warming and Biological Diversity* (Yale University, New Haven, CT).

DeLeon, Mark F., 1981a. *A Study of the Environment and Prehistoric Occupation in the Black Creek Basin of the Piney Woods of South Mississippi*, M.A. Thesis (University of Southern Mississippi, Hattiesburg).

______, 1981b. *Cultural Resources Overview for the National Forests in Mississippi*, (U.S. Department of Agriculture [USDA] Forest Service, Jackson, Mississippi).

______, 1983. *Cultural Resource Survey, Proposed Maneuver Area, DeSoto National Forest, Perry County, Mississippi*. U.S. Department of Agriculture Forest Service, submitted to the Mississippi State Historic Preservation Officer.

Diersing, V.E., and W.D. Severinghaus, 1984. *The Effects of Tactical Vehicle Training on the Lands of Fort Carson, Colorado - An Ecological Assessment*, Technical Report N-85/03/ADA152142 (U.S. Army Construction Engineering Research Laboratories [USACERL]).

_____, and W.D. Severinghaus, 1985. *Wildlife as an Indicator of Site quality and Site Trafficability During Army Training Maneuvers*. Technical Report N-86/03/ADA163560 (U.S. Army Construction Engineering Research Laboratories [USACERL]).

Dissmeyer, G.E. and R.F. Stump, 1978. *Predicted Erosion Rates for Forest Management Activities in the Southeast*, Research Report (U.S. Department of Agriculture [USDA] Forest Service, Southeastern Area, Atlanta GA).

Dixon, R.K., J.K. Winjum, and P.E. Schroeder. 1993. "Conservation and Sequestration of Carbon: The Potential of Forest and Agroforest Management Practices," *Global Environmental Change*, vol 40, pp 159-173.

Dunston, C.E., 1913. *Forest Conditions of Mississippi*, Mississippi State Geological Survey Bulletin No. 11. Preliminary Examination of the Forest Conditions of Mississippi. Rpt. Bulletin No. 5 and No. 7 added, 1913.

Edge, W.D. and C.L. Marcum, 1985. "Movements of Elk in Relation to Logging Disturbances," *Journal of Wildlife Management*, vol 49, pp 926-930.

Edge, W.D., C.L. Marcum, and S.L. Olson, 1985. "Effects of Logging Activities on Home-Range Fidelity of Elk," *Journal of Wildlife Management,* vol 49, pp 741-744.

Ellis, D.H., 1981. *Responses of Raptorial Birds to Low Level Military Jets and Sonic Booms.* NTIS ADA108-778, Results of the 1980-1981 Joint USAF-USFWS Study (National Technology Information Service [NTIS], Springfield, VA) 59 pp.

Erbach, D. C., S. W. Melvin, R. M. Cruse, and D. C. Janzen, 1986. *Effects of Tractor Tracks During Secondary Tillage on Corn Production.* Technical Paper no. 86-1533 (American Society of Agricultural Engineers, St. Joseph, MI).

Exum, J.H., J.A. McGlincy, D.W. Speake, J.L. Buckner, and F.M. Stanley, 1987. *Ecology of the Eastern Wild Turkey in an Intensively Managed Pine Forest in Southern Alabama* (Tall Timbers Research Station, Tallahassee, FL) Bulletin no. 23.

Fernandez, Carmelo, 1993. "Human Disturbance Affects Parental Care of Marsh Harriers and Nutritional Status of Nestlings." *Journal of Wildlife Management*, vol 57, no. 3, pp 602-608.

Finch, D.M., 1991. *Population Ecology, Habitat Requirements, and Conservation of Neotropical Migratory Birds,* General Technical Report RM-205 (U.S. Department of Agriculture [USDA] Forest Service, Rocky Mountain Forest and Range Experiment Station).

Fleischner, T.L., and S. Weisberg, 1986. *Effects of Jet Aircraft Activity on Bald Eagles in the Vicinity of Bellingham International Airport.* Unpublished Report (DEVCO Aviation Consultants, Bellingham, WA) pp 12.

Forman, T.T., and M. Godron, 1981. "Patches and Structural Components for a Landscape Ecology," *BioScience,* vol 31, pp 733-740.

Frings, H., and F. Little, 1957. "Reactions of Honey Bees in the Hive to Simple Sounds," *Science*, vol 125, pp 122.

Fyfe, R.W., and R.R. Olendorff, 1976. *Minimizing the Dangers of Nesting Studies to Raptors and other Sensitive Species*, Canadian Wildlife Service Occasional Papers, No. 3.

Gameda, S., G. S. V. Raghaven, R. Theriault and E. McKyes, 1985. "High Axle Load Compaction and Corn Yield," *Transactions of the American Society of Agricultural Engineers,* vol 28, no. 6, pp 1759-1965.

Gaultney, L., G. W. Krutz, G. C. Steinhardt and J. B. Liljedahl, 1982. "Effect of Subsoil Compaction of Corn Yield," *Transactions of the American Society of Agricultural Engineers*, vol 25, no 3, pp 563-569, 575.

Geese, E.M., O.R. Rongstad, and W.R. Mutton, 1992. "Changes in Coyote Movements Due to Military Activity," *Journal of Wildlife Management*, vol 29, pp 741-744.

Giliberti, Joseph A, 1990. *Assessment, Cultural Resources Investigation, Proposed Camp Shelby Land Exchange*. Report prepared for U.S. Forest Service.

Gill, William R., and Carl A. Reaves, 1956. "Compaction Patterns of Smooth Rubber Tires," *Agricultural Engineer,* vol 37, pp 677-680.

Goran, W.D., L.L. Radke, and W.D. Severinghaus, 1983. *An Overview of the Ecological Effects of Tracked Vehicles on Major U.S. Army Installations*, Technical Report N-142, U.S. Army Construction Engineering Research Laboratory [USACERL].

Grier, J.W., 1969. "Bald Eagle Behavior and Productivity Responses to Climing to Nests," *Journal of Wildlife Management*, vol 33, pp 961-966.

Grier, J.W. and R.W. Fyfe, 1987. "Preventing Research and Management Disturbance," B.A. Giron Pendleton, B.A. Milsap, K.W. Cline and D.M. Bird, eds., *Raptor Management Techniques Manual* (National Wildlife Federation, Washington, D.C.) pp 173-182.

Hamel, P.B, H.E. LeGrand, Jr., M.R. Lennartz, and S.A. Gauthreaux, Jr., 1982. *Bird-Habitat Relationships on Southeastern Forest Lands,* General Technical Report WE-22 Forest Service, pp 417.

Hanson, A.J., T.A. Spies, F.J. Swanson, and J.L. Ohmann, 1991. "Conserving Biodiversity in Managed Forests: Lessons from Natural Forests," *Bioscience,* vol 41, pp 382-392.

Harris, L.D., 1988. "The Faunal Significance of Fragmentation of Southeastern Bottomland Forests," D.L. Hook and R. Lea, eds., *Proceedings of the Symposium, The Forested Wetlands of the Southeastern United States* (Orlando, FL, July 12-14), pp 126-133.

Hausenbuiller, R.L., 1985. *Soil Science* (William C. Brown Company Publishers, IA).

Heath, L.S., P.E. Kauppi, P. Burschel, H.D. Gregor, R. Guderian, G.H. Kohlmaier, S. Lorenz, D. Overdieck, F. Scholz, H. Thomasius, and M. Weber, 1993. "Contribution of Temperate Forests to the World's Carbon Budget," *Terrestrial Biospheric Carbon Fluxes: Quantification of Sinks and Sources of CO_2*, K. Wisnieski and R.N. Sampson, eds., (Kluwer Academic Publishers, Dordrecht, Netherlands).

Heintzelman, D.S., 1979. *Hawks and Owls of North America* (Universe Books).

Hellawell, J.M. 1986. "Biological Indicators," *Biological Indicators of Freshwater Pollution and Environmental Management* (Elsiver, London).

Hershey, T.J. and T.A. Legee, 1982. *Elk Movements and Habitat Use on a Managed Forest in North-Central Idaho.* Bulletin 10 (Idaho Department of Fish and Game Wildlife), pp 24.

Higgins, T.H., 1974. *The Response of Songbirds to the Seismic Compression Waves Preceeding Sonic Booms*, (FAA-RD-74-78 National Technology Information Service, Springfield, VA), pp 28.

Holthuijzen, A.M.A., 1989. *Behavior and Productivity of Nesting Prairie Falcons in Relation to Construction Activities at Swan Falls Dam,* Final Report (Idaho Power Co., Boise, Idaho).

Hooper, R.G., A.F. Robinson, and J.A Jackson, 1990. *The Red-Cockaded Woodpecker: Notes on Life History and Management*, General Report SA-GR9 (U.S. Department of Agriculture [USDA] Forest Service, Southeastern Area), pp 8.

Houghton, R.A., J.D. Unruh, and P.A. LeFebvre, 1993. "Current Land Cover in the Tropics and its Potential for Sequestering Carbon," *Global Biogeochemical Cycles,* vol 7, pp 305-320.

Howell, F.G. and S.T.Ross, 1982. *Aquatic Survey of Black Creek, 1977-1980* (University of Southern Mississippi), pp 124.

Howell, J., B. Smith, J.B. Holt, Jr., and D.R. Osborn, 1978. "Habitat Structure and Productivity in Red-Tailed Hawks," *Bird-Banding,* vol 49, pp 162-171.

Hynson, J.P. Adamus, S. Tibbetts, and R. Darnall, 1982. *Handbook for Protection of Fish and Wildlife from Construction of Farm and Forest Roads: Best Management Practices for Building Activities Associated with the Discharge of Dredged Fill Material*, Report FWS/OBS-82/18 (U.S. Department of Interior, Fish and Wildlife Service), pp 153.

Jackson, J.A., B.J. Schardien, and T.H. McDaniel, 1977. "Opportunistic Hunting of a Marsh Hawk on a Bombing Range," *Journal of Raptor Research,* vol 11, pp 86.

Johnson, F.L., R.A. Thompson, R. Rudman, J.R. Estes, G.D. Schnell, and K.D. Harris, 1990. *Floral Inventory of Fort Sill, Oklahoma.* Final Report to U.S. Army Construction Engineering Research Laboratory [USACERL] (Oklahoma Biological Survey, University of Oklahoma).

Johnson, M. K., 1987. "Inventory of Mammals and Birds on Bigfoot and Aireyu Grazing Allotments of the DeSoto National Forest, Mississippi," *Ecological, Physical and Socioeconomic Relationships within Southern National Forests*, General Technical Report SO-68 U.S. Department of Agriculture [USDA], Forest Service (Southern Experiment Station), pp 293.

Johnston, V.R., 1947. "Breeding Birds of the Forest Edge in Illinois," *Condor*, vol 49, pp 45-53.

Jones, C. and C.H. Carter, 1989. *Annotated Checklist of the Recent Mammals of Mississippi*, Occasional Paper Mus. (Texas Technical University), vol 128, pp 1-9.

Klein, D.R., 1973. *The Reaction of Some Northern Mammals to Aircraft Disturbance.* 11th International Congress on Game Biology (National Swedish Environmental Protection Board, Stockholm, Sweden, September 3-7), pp 377-383.

Kochinderefer, J. N., P. J. Edwards and J. D. Helvey, 1990. "Land Management and Water Yield in the Appalachians," *Watershed Planning and Analysis in Action* (American Society of Civil Engineers, [ASCE]), pp 523-532.

Krzysik, A.J., 1987. *A Review of Bird Pests and Their Management.* Technical Report REMR-EM-1 (U.S. Army Construction Engineering Research Laboratory [USACERL]), pp 144.

Krzysik, A.J., 1989. *Birds in Human Modified Environments and Bird Damage Control: Social, Economic and Health Implications.* Technical Report N-90/03 (U.S. Army Construction Engineering Research Laboratory [USACERL]), pp 190.

Krzysik, A.J., 1990. "Biodiversity in Riparian Communities and Watershed Management," R.E. Riggins, E.B. Jones, R. Singh, and P.A. Rechard, eds., *Proceedings of the Symposium held at Durango, CO, Watershed Planning and Analysis in Action* (American Society of Civil Engineers, New York, NY), pp 533-548.

Kuchler, A.W., 1964. *Potential Natural Vegetation of the Conterminous United States,* Special Publication no. 36 (American Geographic Society).

Lee, J.A., 1981. "Habituation to Human Disturbance in Nesting Accipiters," *Journal of Raptor Research*, vol 15, pp 48-52.

Little, H., 1959. "Reactions of Honey Bees to Oscillations of Known Frequency," *Anatomical Record,* vol 134, pp 601.

Livingston, R.J., 1992. "Medium-Sized Rivers of the Gulf Coastal Plain," *Biodiversity of the Southeast United States - Aquatic Communities*. C.T. Hackney, S.M. Adams and W.H. Martin eds., (John Wiley and Sons, New York).

Lowe, E.N., 1913, *Forest Conditions of Mississippi*, Bulletin No. 11, Note on the Flora of Mississippi (Mississippi State Geological Survey) Rpt. Bulletins No. 5 and No. 7 added.

Lozar, R.C. and D.J. Smead, 1983. *Data Availability to Support a Standardized Military Geographical Information System Database*, Technical Report N-147 (U.S. Army Construction Engineering Research Laboratory [USACERL], March 1983).

Lynch, T.E., and D.W. Speake, 1978. "Eastern Wild Turkey Behavioral Responses Induced by Sonic Boom," J.L. Fletcher and R.G. Busnel, eds., *Effects of Noise on Wildlife* (Academic Press, New York), pp 47-61.

MacArthur, R.H. and Wilson, 1967. *The Theory of Island Biogeography*. (Princeton University Press, Princeton, NJ).

MacClintock, L., R.F. Whitcomb, and B.L. Whitcomb, 1977. "Evidence for the Value of Corridors and Minimization of Isolation in Preservation of Biotic Diversity," *American Birds*, vol 31, pp 6-12.

Manci, K.M., D.N. Gladwin, R. Villella, and M.G. Cavendish, 1988. *Effects of Aircraft Noise and Sonic Booms on Domestic Animals and Wildlife: A Literature Synthesis*. NERC-88/29 (U.S. Fish and Wildife National Ecology Research Center, Ft. Collins, CO), pp 88.

McKay, W.D. *Nesting Density and Distribution of Red-Tailed Hawks and Great Horned Owls on a Quadrangle in Unglaciated Ohio*. Master's Thesis (Ohio State University, Columbus, OH).

Miller, H.W. and D.H. Johnston, 1978. "Interpreting the Results of Nesting Studies," *Journal of Wildlife Management*, vol 42, pp 471-476.

Mississippi Forestry Commission, 1986. *Directory of Mississippi's Forest Industries 1985* (July).

Mississippi Museum of Natural Science, 1991. Records (Fish collected from Perry and Forrest Counties as of April 15, 1991).

Mitasova, H., J. Hofierka, M. Zlocha and L.R. Iverson, 1993. *Modeling Topographic Potential For Erosion and Deposition using GIS* (Submitted to the International Journal of GIS).

Montapero, T., 1988. *First Northern Harrier Nest in Southwestern Oklahoma*, Bulletin of the Oklahoma Ornithological Society, vol 21, pp 12-13.

Morris, M.M.J., and R.E. Lemon, 1983. "Characteristics of Vegetation and Topography near Red-Shouldered Hawk Nests in Southwestern Quebec," *Journal of Wildlife Management,* vol 47, pp 138-145.

Morse, E.S. 1980. "Population Limitation: Breeding or Wintering Grounds in Keast," Morton, E.S., eds. *Migrant Birds in the Neotropics: Ecology, Behavior, Distribution and Conservation* (Smithsonian Institution Press, Washington, D.C.), pp 505-516.

Mosher, J.A., K. Titus, and M.R. Fuller, 1987. "Habitat Sampling, Measurement and Evaluation," B.A. Giron Pendelton, B.A. Milsap, K.W. Cline and D.M. Bird, eds. *Raptor Management Techniques Manual* (National Wildlife Federation, Washington, D.C.), pp 81-97.

National Academy of Science, 1991. *Policy Implications of Global Warming* (Washington, D.C.).

National Council of the Pater Industy for Aioe and Stream Improvement, Inc., 1992. *The Effectiveness of Buffer Strips for Ameliorating Offsite Transport of Sediment, Nutrients, and Pesticides from Silvicultural Operations*, Technical Bulletin. no. 631, (New York).

Neal, W.A., 1990. *Gopher Tortoise Gopherus polyphemus Recovery Plan* (U.S. Fish and Wildlife Service [USFWS], Southeast Region, Atlanta, GA., December 26).

Nelson, M.W., 1982. "Human Impacts on Golden Eagles: A Positive Outlook for the 1980s and 1990s," *Journal Raptor Research*, vol 16, pp 97-103.

Newton, I., 1979. *Population Ecology of Raptors* (Buteo Books).

Nigh, T.A., W.L. Pflieger, P.L. Redfearn, Jr., W.A. Schroeder, A.R. Templeton, and F.R. Thompson III, 1992. *The Biodiversity of Missouri: Definition, Status, and Recommendations for its Conservation,* Report of the Biodiversity Task Force (Missouri Department of Conservation and the U.S. Forest Service), pp 53.

Noss, R.F., 1982. "A Regional Landscape Approach to Maintain Biodiversity," *BioScience,* vol 33, pp 700-706.

O'Malley, R., L. Langstaff, and M. Southerland, 1993. *Incorporating Biodiversity Considerations into Environmental Impact Analysis Under the National Environmental Policy Act.* Report of the Council on Environmental Quality (Executive Office of the President, Washington, D.C.), pp 29.

Orr, S.J., and P.B. Tirerell, 1983. *Examination of Red-Tailed Hawk Buteo jamaicencis for the Presence of Myiasis by Protocalliphora spp. (DIPTERA) in Oklahoma.*

Orr, S.J., 1991. Personal Communication. Subject, Raptor Nest Failure.

Padgett, Thomas J. and David M. Heisler, 1979. *Predictive Model of Archaeological Site Location in the Central Leaf River Basin, Mississippi* (University of Southern Mississippi, for the Mississippi Department of Archives and History, Jackson, MI).

Palmer, R.S. 1988. *Handbook of North American Birds* (Yale University Press), vol 4-6.

Pearson, H.A., R.R. Lohoefener, and J.L. Wolfe, 1987. "Amphibians and Reptiles on Longleaf-Slash Pine Forests in Southern Mississippi," *Ecological, Physical, and Socioeconomic Relationships within Southern National Forests,* General Technical Report SO-68 (U.S. Department of Agriculture [USDA], Forest Service, Southern Forest Experiment Station), pp 157-165.

Pearson, H.A., J.L. Wolfe, and R.R. Lohoefener, 1987. "Fish diversity and abundance in streams of the DeSoto National Forest in Mississippi," *Ecological, Physical, and Socioeconomic Relationships within Southern National Forests,* General Technical Report SO-68, (U.S. Department of Agriculture [USDA], Forest Service, Southern Forest Experiment Station), pp 179-185.

Peterson, L., 1980. *Ecology of Great Horned Owls and Red-Tailed Hawks in Southeastern Wisconsin.* Technical Note No. 11 (Dept. of Natural Resources, University of Wisconsin-Madison).

Peterson, R.T., 1980. *Peterson Field Guides: Eastern Birds* (Houghton Mifflin Co., Boston), pp 384.

Pilcher, B.K. and G.E. Wampler, 1982. "Hunting Season Movements of White-Tailed Deer on Fort Sill Military Reservation, Oklahoma," *Proceedings from Annual Conference of the Southeastern Association Fish and Wildlife Agencies*, vol 35, pp 42-148.

Rayburn L.E. and E.G. Shows, 1991. Personal Communication, Subject, Wildlife Feeding Observations.

Regosin, J.V., S.J. Orr, and J. Sarnat, 1991. *Recent Breeding Records for the Northern Harrier in Southwestern Oklahoma.* Bulletin of the Oklahoma Ornithological Society, vol 24, pp 30.

Renard, K.G., G.R. Foster, G.A. Weesies and D.K. McCool (coordinators), 1992. *Predicting Soil Erosion by Water - A Guide to Conservation Planning with the Revised Universal Soil Loss Equation (RUSLE).* USDA-ARS Special Publication 1992.

Riley, F.L., ed., 1906., Clairborne, J.F.H., 1841. "A Trip Through the Piney Woods," *Publications of the Mississippi Historical Society,* vol 9.

Robinson, D.P., J.W. Hamilton, R.D. Webster, M.J. Olson, 1984. *Economic Impact Forecast System (EIFS) II: User's Manual.* Technical Report N-69 (Revised) (U.S. Army Construction Engineering Research Laboratory [USACERL] Updated Edition, May).

Robinson, G.R., R.D. Holt, M.S. Gaines, S.P. Hamburg, M.L. Johnson, H.S. Fitch, and E.A. Martinko, 1992. "Diverse and Contrasting Effects of Habitat Fragmentation," *Science,* vol 257, pp 524-526.

Root, B.G., E.K. Fritzell and N.F. Giessman, 1988. *Effects of Intensive Hunting on White-Tailed Deer Movement*, Bulletin 16 Wildlife Society, pp 145-151.

Rose, G.B., 1977. "Mortality Rates of Adult Cottontail Rabbits," *Journal of Wildlife Management*, vol 41.

Rosenburg, D.M. and V.H. Resh eds., 1993. "Introduction to Freshwater Biomonitoring and Benthic Macroinvertebrates," *Freshwater Biomonitoring and Benthic Macroinvertebrates* (Chapman and Hall, New York, NY).

Rosenfield, C.M. Morasky, J. Bielefeldt, and W.L. Loope, 1992. *Forest Fragmentation and Island Biogeography: A Summary and Bibliography*. Technical Report No. NPS/NRUW/NRTR-92/08 (U.S. Department of the Interior, National Park Service), pp 52.

Rucker, R.R. 1973. *Effects of Sonic Booms on Fish*, Report no. FAA-RD-73-29 (Dept. of Transportation, Federal Aviation Administration, Washington, D.C.), pp 67.

Russo, J.P., 1964. *The Kaibab North Deer Herd*, Bulletin No. 7 (Arizona Game and Fish Department, Wildlife).

Schuler, R. T. and B. Lowery, 1984. *Subsoil Compaction Effect on Corn Production With Two Soils Types*. Paper 84-1032 (American Society of Agricultural Engineers, St. Joseph, MI).

Schuler, R. T., and B. Lowery, 1986. *Long Term Compaction Effect on Soil and Plant Growth.* Paper No. 86-1048, (American Society of Agricultural Engineers, St. Joseph, MI).

Schwarz, A.L., and G.L. Greer, 1984. "Responses of Pacific Herring, Clupea harengus pallasi, to Some Underwater Sounds," *Canadian Journal of Fish and Aquatic Science*, vol 41, pp 1183-1192.

Scott, V.E., 1979. "Bird Response to Snag Removal in Ponderosa Pine," *Journal of Forestry*, vol 76, pp 26-28.

Seehorn, M.E., 1976. "Fishes of the Southeastern National Forests," *Proceedings from Annual Conference Southeastern Association of Game and Fish Commission*, vol 29, pp 10-27.

Severinghaus, W.D. and M. L. Denight, 1993. "Environmental Awareness and Combat Training," *Engineering Magazine*.

Severinghaus, W.D., W.D. Goran, G.D. Schnell, and F.L. Johnson, 1981. *Effects of Tactical Vehical Activity on the Mammals, Birds, and Vegetation at Fort Hood, Texas.* Technical Report N-113 (U.S. Army Construction Engineering Research Laboratory [USACERL]).

Severinghaus, W.D., R.E. Riggins, and W.D. Goran, 1979. *Effects of Tracked Vehicle Activity on the Mammals, Birds, and Vegetation at Fort Lewis, Washington.* Technical Report N-77 (U.S. Army Construction Engineering Research Laboratory [USACERL]).

Severinghaus, W.D., and W.D. Goran, 1981. *Effects of Tactical Vehicle Activity on the Mammals, Birds, and Vegetation at Fort Lewis, Washington.* Technical Report N-116, (U.S. Army Construction Engineering Research Laboratory [USACERL]).

Severinghaus, W.D., 1984. *Effects of Tracked Vehicle Activity on Higher Vertebrate Populations at Army Installations.* Technical Manuscript N-177 (U.S. Army Construction Engineering Reasearch Laboratory [USACERL]).

Severinghaus, W.D., R.E. Riggins, and W.D. Goran. 1980. "Effects of Tracked Vehicles on Terrestrial Mammals and Birds at Fort Knox, KY," *Transactions of the Kentucky Academy of Science*, vol 41. pp 15-26.

Shafer, C.L., 1990. *Nature Reserves: Island Theory and Conservation Practice*. N. Rudnick, ed., (Smithsonian Institution Press, Washington D.C.).

Shugart, H.H., T.M. Smith, J.T. Kitchings, and R.L. Kroodsma, 1987. "The Relationship of Nongame Birds to Southern Forest Types and Successional Stages," *Proceeding of The Workshop Management of Southern Forests for Nongame Birds*, U.S. Forest Service General Technical Report SE-14, pp 5-16.

Smith, S.H., 1992. *United States Forest Response and Vulnerability to Climate Change* (Yale University School of Forestry and Environmental Studies, New Haven, CT).

Smock, L.A. and E. Gilinsky, 1992. *Coastal Plain Blackwater Streams Biodiversity of the Southeast United States - Aquatic Communities*. C.T. Hackney, S.M. Adams, and W.H. Martin eds. (John Wiley and Sons, New York, NY).

Snyder, N.F.R., H.W. Kale, and P.W. Sykes, 1978. *An Evaluation of some Potential Impacts of the Proposed Dade County Training Jetport on the Endangered Everglade Kite. Florida Audubon Society.* Unpublished Report.

Soehne, W., 1958. "Fundamentals of Pressure Distribution and Soil Compaction under Tractor Tires," *Agricultural Engineering*, pp 39.

Solbrig, O.T., 1991. "The Origin and Function of Biodiversity," *Environment*, vol 33, pp 17-38.

Steenhof, K. and M.N. Kochert, 1988. "Dietary Responses of Three Raptor Species to Changing Prey Densities in a Natural Environment," *Journal of Animal Ecology*, vol 57, pp 37-48.

______, and M.N Kochert, 1982. "An Evaluation of Methods Used to Estimate Raptor Nesting Success," *Journal of Wildlife Management,* vol 46, pp 885-893.

Stephenson, T.R., 1989. *Mule Deer Response to Military Activity in Southeast Colorado.* M.S. Thesis. (Virginia Polytechnic Institute and State University).

Strohler, A.N. *Dynamic Basis of Geomorphology.* Bulletin 69 Geological Society of America, pp 923-938.

Swan, J. B., J. F. Moncrief and W. B. Voorhees, 1987. *Soil Compaction Causes, Effects, and Control*, AG-BU-3115 (Minnesota Extension Service, University of Minnesota).

Swift, L. W., 1990. "Filter Strip Widths for Forest Roads in the Southern Appalachians," *Southern Journal of Appl. Forestry*, vol 10: pp 27-34.

Taylor, H. M., 1971. "Effects of Soil Strength on Seedling Emergence, Root Growth and Crop Yield," *Compaction of Agricultural Soils,* Chapter 6 (American Society of Agricultural Engineers Monograph, St. Joseph, MI), pp 292-305.

Tazik, D.J., and L. Adams, 1990. *Threatened and Endangered Wildlife Species on U.S. Army Installations.* Draft Report (U.S. Army Construction Engineering Research Laboratory [USACERL]).

Tazik, D.J., S. D. Warren, V. E. Diersing, R. B. Shaw, R. J., Brozka, C. A. Bagley, and W. R. Whitworth., 1991. *U.S. Army Land Condition-Trend Analysis Field Methods* (U.S. Army Construction Engineering Research Laboratory [USACERL]).

______, W.D. Severinghaus, and V.E. Diersing, 1985. *Annual Variation in Populations of Birds and Small mammals on an Army Installation*, Interim Report N-86/02/ADA164631 (U.S. Army Construction Engineering Research Laboratory [USACERL]).

______, S.D. Warren, V.E Diersing, R.B. Shaw, R.J. Brozka, C.A. Bagley and W.R. Whitworth, 1992. *U.S. Army Land Condition-Trend Analysis (LCTA) Plot Inventory Field Methods*, Technical Report N-92/03 (U.S. Army Construction Engineering Laboratory [USACERL]).

Teer, J.G., and J.C. Truett, 1973. *Studies of the Effects of Sonic Boom on Birds*. Report No. FAA-RD (U.S. Department of Transportation).

Tevis, L.T., 1956. "Effect of a Slash Burn on Forest Mice," *Journal of Wildlife Management,* vol 20, pp 405-409.

Tirrell, P.B., 1978. "Protocalliphora avium (DIPTERA) Myiasis in Great Horned Owls, Red-Tailed Hawks, and Swainson's Hawks in North Dakota." *Journal of Raptor Research,* vol 12, pp 21-27.

Titus, K., and J.A. Mosher, 1981. "Nest Site Habitat Selected by Woodland Hawks in the Central Appalachians," *Auk,* vol 98, pp 270-281.

Trouse, A. C. Jr., 1971. "Soil Conditions as They Affect Plant Establishments, Root Development and Yield: Effects of Soil Moisture and Plant Activities." *Compaction of Agricultural Soils*. K. K. Barnes et al. ed. (American Society of Agricultural Engineers, St. Joseph, MI).

Tucker, R.R., 1973. *Effects of Sonic Booms on Fish*. Report No. FAA-RD-73-29 (Department of Transportation, Federal Aviation Administration, Washington, D.C.), pp 67.

Tyler, J.D., S.J. Orr, and J.R. Banta, 1989. *The Red-Shouldered Hawk in Southwestern Oklahoma*. Bulletin of the Oklahoma Ornithological Society, vol 22, pp 17-21.

Vachta, E. G., and R. E. Riggins, 1988. *Erosion Control Methods for Army Training Land Rehabilitation: Summary of Current Technology,* Technical Report N-88/05 (U.S. Army Construction Engineering Research Laboratory [USACERL]).

Vachta, E. G., and R. E. Riggins, 1990. *Erosion Control Management Plan for Army Training Lands: Physical/Structural Erosion Control for Training Land Rehabilitation.* Technical Report N-90/11 (U.S. Army Construction Engineering Research Laboratory [USACERL]).

Verbeek, N.A.M., 1982. Egg predation by northwestern crows: It's association with human and bald eagle activity. *Auk,* vol 99, pp 347-352.

Wahlenberg, W.G., 1946. *Effects of Fire and Cattle Grazing on longleaf Pine Lands, as Studied at McNeill, Mississippi*, Technical Bulletin No. 683 (U.S. Department of Agriculture [USDA]).

Ward, D.H., R.A. Stehn, D.V. Derksen, C.J. Lensink, and A.J. Loranger, 1986. *Behavior of Pacific Black Brant and other Geese in Response to Aircraft Overflights and other Disturbances at Izembek Lagoon, Alaska* (U.S. Fish and Wildlife Service, Alaska Fish and Wildlife Research Center), Unpublished Report.

Weller, M.W., I.C. Adams and B.J. Rose, 1955. "Winter Roosts of March Hawks and Short-Eared Owls in Central Missouri," *Wilson Bulletin*, vol 67, pp 189-193.

Westman, W.E., 1990. "Managing for Biodiversity: Unresolved Science and Policy Questions," *BioScience*, vol 40, pp 26-33.

White, C.M., and S.K. Sherrod, 1973. "Advantages and Disadvantages of the Use of Rotor-Winged Aircraft in Raptor Surveys," *Journal of Raptor Research*, vol 7, pp 97-104.

White, J.B., 1993. Personal Communication. Subject, Forest Service Terminology.

Wilcove, D.S., 1985. "Nest Predation in Forest Tracts and the Decline of Migratory Songbirds," *Ecology*, vol 66, pp 1211-1214.

Wilkinson, L., 1986. *SYSTAT: The System for Statistics*, (SYSTAT, Inc).

Windsor, J., 1975. *The Response of Peregrine Falcons, Falco Peregrinus to Aircraft and Human Disturbance* (Canadian Wildlife Service).

Wischmeier, W. H. and D. D. Smith, 1978. *Predicting Rainfall Erosion Losses, A Guide to Conservation Planning*, Handbook no. 537 (U.S. Department of Agriculture [USDA] Science and Education Administration Agriculture), pp 58.

Wittsell, L. E. and J. A. Hobbs, 1965. "Soil Compaction Effects on Field Plant Growth," *Agronomy Journal*, pp 57.

Wolfe, J.L., 1971. *Notes on Mississippi Land Mammals: Distribution, Identification, and Ecological Notes*, (Mississippi Museum of Natural Science).

Wolfe, J.L. and R.R. Lohoefener, 1987. "The Small Mammal Fauna of a Longleaf Slash Pine Forest in Southern Mississippi," *Ecological, Physical, and Socioeconomic Relationships within Southern National Forests*, General Technical Report SO-68 (U.S. Department of Agriculture [USDA] Forest Service, Southern Forest Experiment Station), pp 171-177.

Yahner, R.H., 1992. "Dynamics of a Small Mammal Community in a Fragmented Forest," *American Midland Naturalist*, vol 127, pp 381-391.

Yahner, R.H., and D.P. Scott, 1988. "Effects of Forest Fragmentation on Depredation of Artificial Nests," *Journal of Wildlife Management*, vol 52, pp 158-161.

Young, S.P., 1944, *The Wolves of North America (Part 1),* 1964 reprint (Dover, New York) pp 385.

Zelick, A, and P.M. Narins, 1980. "Behavioral Response of Treefrogs to Low-level Sound Stimuli," (Abstract only) *Journal of Acoustic Society of America,* vol 68, pp 97 (Suppl. 1).

Consultants and Specific Camp Shelby Reports

Block, Paul, R., Christine M. Bern, Laura K. Stretch, David L. Price, Robert B. Shaw, 1990/1991. *Land Condition Trend Analysis Installation Report, Camp Shelby Training Site, Mississippi.*

Camp Shelby Training Site, Programmed Project Status Report (February 27, 1991).

Carter, L. M. and J. R. Tavernetti, 1971. "Evaluation of Tillage Systems for Cotton," *Transactions,* Camp Shelby, Mississippi Real Estate Planning Report. (American Society of Agricultural Engineers [ASAE]), vol 14, no. 6, pp 1116-1121.

Decision Notice and Finding of No Significant Impact for Amendment of the Camp Shelby Special Use Permit Allowing Fielding of the M-1, M60A3, and the Bradley Fighting Vehicle (October, 1986).

Department of Wildlife and Fisheries. *Erosion Control Plan for Camp Shelby,* (Mississippi State University, 1988).

Fitzpatrick, J. F., Jr., 1991. *Status Survey Report Camp Shelby Crayfish,* Report prepared for U.S. Army Corps of Engineers, Champaign, IL.

Forest Resources Management Plan for Camp Shelby National Guard Training Site, Hattiesburg, MS (Resource Consulting International Ltd., August 21, 1987).

Gordon, K., 1993. Personal Communication. Subject, Reptiles Expected to Occur on Camp Shelby.

Hurst, Michael R. Zone, Wildlife Biologist, 1991. *Biological Evaluation of the Tank Table VIII Range 45 B Project of Camp Shelby* (DeSoto National Forest, April 24).

Jackson, S.L., *Scoping Meeting for the Environmental Impact Statement on the Camp Shelby Special Use Permit and Camp Shelby/Pinon Canyon Land Interchange,* Court Report.

Master Agreement Between Department of Defense and Department of Agriculture Concerning the Use of National Forest System (NFS) Land for Military Activity.

Mount, R. H., E. E. Wester, and C. K. Swing, 1988. *Biological Assessment of the Land-Altering Activities of the Mississippi Army National Guard on the Federally Threatened Gopher Tortoise, Gopherus polyphemus at Camp Shelby Military Reservation, Mississippi.* (Mississippi Military Department, Jackson, MS), pp 66.

Noise Assessment, Draft (December 13, 1990).

Offriga, Peter Q., Memorandum for Chief, National Guard Bureau (January 15, 1991).

Palmerton, J.B., *Groundwater Drawdown Analyses for Camp Shelby* (January 5, 1991).

Rayburn, MAJ Lonnie to LTC Conerly, August 7, 1986. Memorandum, Subject: Department of Defense DUD Disposal Site, Attachments.

Record of Decision, Action: ROD for Implementation of Proposed Projects for Mission Expansion/Multiple Construction at Camp Shelby, Mississippi.

Redmond, L.D., 1992. Personal Communication. Subject, Historical Tank Maneuver at Camp Shelby.

Schnell, G.D. and B.R. Chapman, 1991. *Red-Cockaded Woodpecker Survey of Camp Shelby, Mississippi*, Draft Report Oklahoma Biological Survey.

Wester, E.E. and Swing C.K., 1990. *Draft Biological Assessment of the Effects of Military Activities on the Federally Threatened Gopher Tortoise, Gopherus polyphemus, at Camp Shelby, MS* (January 22).

Wester, E.E. and Swing C.K., 1992. *Biological Assessment of the Effects of Continued/Proposed Military Training Activities on the Federally Threatened Gopher Tortoise, Gopherus polyphemus, on Selected Lands at Camp Shelby, MS.*

Weatherford McDade, Ltd., 1988. *Camp Shelby Environmental Impact Statement*, Draft.

Weatherford McDade, Ltd., 1991. *Camp Shelby Environmental Impact Statement*, Final.

Government and Military Publications

Air National Guard (Gulfport Combat Readiness Training Center, Air National Guard Base - Gulport), *Establishment of the Air Combat Maneuvering Instrumentation (ACMI) System and Modification to Airspace for the Mississippi Air National Guard,* MI Draft Environmental Assessment, 1991. (Mobile, Atlanta, February 28).

Anderson, R.L., E. Novak, T. Sydelko, 1981. Integrated Training Area Management [ITAM]: Helping Save Resources, *Army Trainer,* vol 9, pp 32-34.

Army Field Manual [FM] 5-30, *Smoke Operations.*

Army Field Manual [FM] 100-5 (U.S. Government Printing Office, Washington D.C., 1986).

Army Pamphlet 350-38, *Standards in Weapons Training* (October, 1990).

Army Regulation [AR] 200-1, *Environmental Protection Enhancement* (April 23, 1990).

Army Regulation [AR] 200-2, *Environmental Effects of Army Actions* (December 23, 1988).

Army Regulation [AR] 405-10, *Acquisition of Real Property and Interest Therein* (May 14, 1990).

Army Regulation [AR] 405-80, *Granting the Use of Real Estate* (February 1, 1979).

Army Regulation [AR] 405-90, *Disposal of Real Estate* (May 10, 1985).

Army Regulation [AR] 200-2, *U.S. Army Environmental Effects of Army Actions* (U.S. Government Printing Office, Washington D.C, 1988).

Army Training Manual [TM] 9-1300-206, *Ammunition and Explosive Standards* (August, 1973).

Army Training Circular 25-1, *Training Land* (U.S. Government Printing Office, Washington D.C, 1978).

Camp Shelby Regulations:

Aviation, Annex T, Camp Shelby Regulation (January, 1992).

Engineer Support Procedures, Annex E Camp Shelby Regulation (December, 1989).

Environmental Protection, Annex G Camp Shelby Regulation (October, 1992).

Logistical Support Procedures, Camp Shelby Regulation (January, 1993).

Medical Support, Annex M, Camp Shelby Regulation (December, 1991).

Range Regulation, Annex C, Camp Shelby Regulation (January 1993).

Provost Marshal Regulations, Annex P, Camp Shelby Regulation (January, 1993).

Safety Procedures, Annex S, Camp Shelby Regulation (January, 1992).

Spill Prevention, Control and Countermeasure Plan, Annex F, Camp Shelby Regulation (October, 1992).

Code of Federal Regulations (CFR), Title 40, Parts 1500-1508. *Regulations For Implementing the Provisions of The National Environmental Policy Act.*

Code of Federal Regulations (CFR), Title 40, Part 270. *EPA Administered Permit Programs: The Hazardous Waste Permit Program.*

Code of Federal Regulations (CFR), Title 40, Part 271. *Requirements for Authorization of State Hazardous Waste Programs.* Concept design for the multipurpose range complex upgrade, Fort Polk, Louisiana. FY90 MCA L.I. 269 (Dannenbaum Engineering Corporation, October 1988).

Environmental Assessment For Calfex Assembly Areas Camp Shelby. Draft.

Federal Register, 50 CFR Part 402.12 (U.S. Government Printing Office, Washington, D.C., June 3, 1986).

Federal Register 55:3 (U.S. Government Printing Office, Washington, D.C., January 4, 1991), pp 351.

Federal Register 56:31 (U.S. Government Printing Office, Washington, D.C., February 14, 1991).

Government Accounting Office, 1991. *Peacetime Training Did Not Adequately Prepare Combat Brigades for Gulf War.* Report (U.S. Government Printing Office, Washington, D.C., September).

Mississippi Army National Guard, 1989. *Environmental Assessment for Bridge Replacement on Cypress Creek and Joe's Creek Camp Shelby, MS.* Draft (November).

Mississippi Army National Guard, 1990. *Environmental Assessment for Calfex Assembly Areas, Camp Shelby, MS*. Draft (May).

Mississippi Army National Guard, 1989. *Environmental Assessment for Proposed Artillery Firing Points Camp Shelby, MS*, Draft (March).

Mississippi Army National Guard, 1989. *Environmental Assessment for Range 43 Complex Camp Shelby, MS*, Draft (February).

Mississippi Army National Guard, 1989. *Environmental Assessment for range 50 Complex Camp Shelby, MS*. Draft (March).

Mississippi Army National Guard, 1990. *Environmental Assessment for Range 45 Automated Tank Table VIII*. Draft (June).

Mississippi Army National Guard, *Five Year Range and Training Area Development Plan for Camp Shelby and Camp McCain, FY 91-95*, (Office of the Adjutant General State Area Command-Mississippi).

Mississippi Army National Guard, 1989. *Hazardous Waste Management Plan for Large Quantity Generators*, (HQ, STARC (-) Facilities Management Office, Jackson, MS, April 20).

Mississippi Army National Guard [MSARNG], 1990. *Land Use Requirements Study.*

National Environmental Policy Act of 1969, as amended, PL 91-190, 42 U.S.C. 4321-4347, January 1, 1970, as amended by PL 94-52 July 3, 1975, and PL 94-83 (August 9, 1975).

Public Law 101-510, Section 2585, 1991 DOD Authorization Act (November 5, 1990).

Surgeon General, June, 1985. *Occupational and Environmental Health: Control of Hazards to Health from Lazer Radiation.*

Supplement to MS Army National Guard Environmental Assessment for Proposed Artillery Firing Points, Camp Shelby, MS (May 11, 1989).

U.S. Army Construction Engineering Research Laboratory [USACERL], 1990. *ITAM Technology Transfer Bulletin*, vol 1, no. 90-1.

U.S. Army Corps of Engineers, *MPRC Design Guide* (Huntsville Division).

U.S. Army Engineer Division, 1985. *Design Information for Multipurpose Range Complex* (Huntsville, Alabama, October).

U.S. Department of Agriculture [USDA] Forest Service, Southern Region. *National Forests in Mississippi Land and Resource Management Plan.* Final Environmental Impact Statement (National Oceanic and Atmospheric Association, 1987).

U.S. Department of Agriculture [USDA] Forest Service, 1990. *Implementation Guide for the Management of the Red-Cockaded Woodpecker During the Interim Period.*

U.S. Department of Agriculture [USDA] Forest Service, 1986. Letter to Mississippi Chapter, Sierra Club, 1570 PPB (November 10).

U.S. Department of Agriculture [USDA] Forest Service, 1983. *Camp Shelby Maneuver Area Environmental Assessment Report, Perry County, MS* (Black Creek Ranger District, DeSoto National Forest USDA, Forest Service, Jackson, MS, April 1983), pp 48.

U.S. Department of Agriculture [USDA] Forest Service Manual, 2670.

U.S. Department of Agriculture [USDA] Forest Service Manual, 2672.4.

U.S. Department of Agriculture [USDA] Forest Service Manual, 2672.41.

U.S. Department of Agriculture [USDA] Forest Service, 1991. *Partners in Flight*, Annual Report, vol 2 no. 1, pp 30.

U.S. Department of Agriculture [USDA] Forest Service *Vegetation Management in the Coastal Plain/Piedmont* Final Environmental Impact Statement, vol I, II, III (Southern Region, January, 1989).

U.S. Department of Agriculture [USDA] Soil Conservation Service, 1970. *Fort Sill Military Reservation Natural Resources Conservation Plan.*

U.S. Department of Agriculture [USDA] Soil Conservation Service, 1979. *Soil Survey for Forrest County Mississippi.*

U.S. Department of Agriculture [USDA] Soil Conservation Service, 1979. *Soil Survey of Jones County, Mississippi.*

U.S. Department of Agriculture [USDA] Soil Conservation Service, 1990. *U.S. Forest Service Decision Notice, Finding of No Significant Impact and Environmental Assessment.*

U.S. Fish and Wildlife Service (FWS) to MS National Guard, January, 1989. Biological Opinion, Regarding the Effects of Continued/Proposed Military Training Activities on the Federally Threatened Gopher Tortoise (Gopherus polyphemus).

U.S. Fish and Wildlife Service (FWS) to National Guard Bureau-ARE, September, 1992. Biological Opinion, Regarding the Effects of Continued/Proposed Military Training Activities on the Federally Threatened Gopher Tortoise (Gopherus polyphemus).

U.S. Fish and Wildlife Service (FWS) to U.S. Forest Service, October, 1993. Biological Opinion, Regarding the Effects of the U.S. Forest Service's (FS) Proposed Issuance of a Special Use Permit (SUP) to the National Guard (NGB) for the Reconfiguration of Tank Maneuver Training and New/Improved Facilities at Camp Shelby, Mississippi, and Its Effects on the Western Population of the Threatened Gopher Tortoise (Gopherus polyphemus).

U.S. Fish and Wildlife Service (FWS), 1993. Public review draft, *Gulf Sturgeon (Acipenser oxyrinchus dosotoi) Recovery/Management Plan.* Prepared by the Gulf Sturgeon Recovery/Management Task Team for the Southeast Region U.S. Fish and Wildlife Service, Gulf States Marine Fisheries Commission, and Natinal MarineFisheries.

U.S. Fish and Wildlife Service (FWS), 1990. Endangered Species Technical Bulletin, vol XV, No. 8, p 4.

U.S. Fish and Wildlife Service (FWS), 1990. *Gopher Tortoise (Gopherus polyphemus) Recovery Plan* (Southeastern Region).

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Final
Environmental Impact Statement

Military Training Use of National Forest Lands: Camp Shelby, Mississippi

Chapter 6

PERSONS AND SOURCES CONTACTED

CHAPTER 6.0 LIST OF PERSONS CONTACTED IN THE COURSE OF THIS STUDY

COMMITTEES

EIS Committee at Camp Shelby:
COL Leland Redmond
COL Sonny Jones
MAJ Robert Lee
MAJ Lonnie Rayburn
Mr. Terry Lee

EIS Biodiversity Conflict Resolution Committee:

Mr. Ken Gordon	MS Natural Science Museum
Dr. Marc Imlay	National Guard Bureau-ARE
Mr. Curtis James	U.S. Fish and Wildlife Service
Mr. Scott Klinger	Wildlife Staff Officer
CPT Bob Piazza	Mississippi Military Department
Mr. John White	National Forest Service

EIS Soil Loss Conflict Resolution Committee:

Mr. Tom Arnold	U.S. Forest Service
CPT Bob Piazza	MS National Guard
CPT Brad Smith	CSTS-DSE
Mr. John White	National Forest Service
Dr. Ben Yen	Univ. of Illinois, Dept. of Civil Engineering

PERSONS CONTACTED

Tom Arnold	U.S. Forest Service, Jackson
Robin Blackman	CESAM-PD-ES
Don Bolinger	U.S. Forest Service
Terry Boose	Defense Mapping Agency
CPT Franklin Brewer	DPTM-CS

COL Everett Cameron	TAG-MS FMO
Joseph Clayton	U.S. Forest Service, Jackson
Glen Coffee	CESAM-PD-EI
Robert D. Collier	South Mississippi Planning and Development District
LTC Perry S.Conerly	DFE-Camp Shelby
COL Chris Conrad	SAILE-ESOH
COL Joe Cornelius	DAJA-EL
Tom Craven	CESAM-PD-EI
George Cummins	Department Of Energy-Environmental Affairs
Duane Daniels	Mississippi State Soil Scientist
Bill Dinkens	Oklahoma Biological Survey
Joe Duckworth	U.S. Forest Service, Wiggins
Mike Eubanks	Mobile District, Corps of Engineers CESAM-PD-EI
Joe Fitzpatrick	University of South Alabama
SFC John Geraci	CSTS-DPTM

Ken Gordon	MS Natural Science Museum, Jackson
Art Graham	National Guard Bureau-ARI
MAJ Larry Harrington	CSTS-DFE-CPS
George Hemingway	U.S. Forest Service
Allen Howell	Weatherford, McDade, LTD.
Marc Imlay, Ph.D.	National Guard Bureau-ARE
Curtis James	U.S. Fish and Wildlife Service
Ken Johnson	U.S. Forest Service, Jackson
Cheri Jones, Ph.D.	Mississippi Museum of Natural Science
COL Sonny Jones	TAGO-DCS-O&T (Mississippi Army National Guard)
Timothy Julius	Army Environmental Office
Dave Ketchum	U.S. Forest Service
Pete Kirby	WESER
Scott Klinger	Wildlife Staff Officer
Joe W. Kolb	Florida Gas Transmission Company

Larry Lawrence	WESER-R
MAJ Robert A. Lee	Mississippi Army National Guard
Terry L. Lee	Camp Shelby Environmental Specialist
Bob Lees	Spot Image Corp
Nelson Lewis	U.S. Army Environmental Hygiene Agency
Jeff Long	U.S. Forest Service, Jackson
MAJ Russ Madderra	ANG CRTC-Gulfport
Mark Mattis	Micro Images
Richard McBryde	DAEN-ZCI-A
LTC Robert L. McGuire	National Guard Bureau-ARE
Pat Morris	Waterways Experiment Station
Frank Moore, Ph.D.	University of Southern Mississippi
LTC Corley Morse	Camp Shelby-DPTM
Samuel Orr	Fort Sill Military Reservation
MAJ Monte L Pearson	CEWES-GV-Z

Don Peterson	Fish and Wildlife Service
Vernon Petty	U.S. Army Engineer Division, Huntsville
CPT Bob Piazza	Mississippi Military Department
Steven Platt	Wettanda Ecological Services
Larry Quick	U.S. Army Engineer Division, Huntsville
LTC Lonnie Rayburn	Camp Shelby Range Control Officer
COL Leland Redmond	Training Site Commander, Camp Shelby
Cathy Robinson	Tennessee Valley Authority
LT Rogers	DPTM, Camp Shelby
William Russell	U.S. Army Environmental Hygiene Agency
Gary Schnell, Ph.D.	Oklahoma Biological Survey
LTC Roger Shields	TAGO-Mississippi Army National Guard
CPT Shows	Camp Shelby-DPTM
Gordon Small	U.S. Forest Service
CPT Brad Smith	CSTS-DSE

MAJ Steve Smith	ANG CRTC-Gulfport
Dave Thompson	Weatherford McDade, LTD.
Dwight Weatherford	Weatherford McDade, LTD.
Jack Weil, Ph.D.	Mississippi Museum of Natural Science
John White	National Forest Service
Bill Willoughby, Ph.D.	Dept. of Army Waterways Experiment Station
Ben Yen, Ph.D.	Univ. of Ilinois, Dept. of Civil Engineering

Final
Environmental Impact Statement

Military Training Use of National Forest Lands: Camp Shelby, Mississippi

Chapter 7

LIST OF PREPARERS

CHAPTER 7.0 LIST OF PREPARERS

A. PRIMARY CONTRIBUTORS TO THE EIS

Harold E. Balbach, Ph.D., CPAg

Project Manager; overall direction; review of text; preparation of results and conclusions

Discipline/Expertise: Botany, Ph.D., 1965, University of Illinois. Certified Professional Agronomist. Area of specialization: Land Management.

Experience: Thirty-two years experience in research and teaching in ecology and environmental biology. Twenty-one years experience in preparation of written guidance, NEPA analysis and documentation, examination of high-visibility environmental problems associated with management of military installation resources, educational presentations, and provision of computer-assisted support to DOD managers. Environmental Complicance Division, U.S. Army Corps of Engineers, Construction Engineering Research Laboratories.

Manroop K. Chawla, M.S.

Prepared quality of life sections; provided overall direction for the economic environment sections;prepared and reviewed responses to public comments; reviewed document.

Discipline/Expertise: Environmental Planner, M.S. in Biology, Masters of Urban Planning (MUP), University of Illinois, 1990.

Experience: Six years experience in environmental analysis, and in planning and execution of major environmental impact studies. Environmental Sustainment Laboratory, U.S. Army Corps of Engineers, Construction Engineering Research Laboratories.

Edward Delisio, M.S.

Assisted with Geographical Resources Analysis Support System (GRASS) data base development and applications for the final EIS version.

Discipline/Expertise: M.S. Forestry, University of Illinois, 1993; B.S. Geology, University of Illinois, 1985.

Experience: Five years experience in river mechanics and sediment transport and analysis at the Illinois State Water Survey, Champaign, Illinois. Two years experience in remote sensing and geographical information systems as a GIS analyst.

Bruce Dickson, M.S.

Prepared sections relevant to the Leaf River Wildlife Management Area.

Discipline/Expertise: Resource Ecologist; A.D. in Wildlife Technology, Pennsylvania State University; B.S. in Environmental Studies, Slippery Rock State College; M.S. in Biology, Clarion University, 1988.

Experience: Ten years experience in aquatic ecology, aquatic biononitoring, freshwater fisheries, and wtaer resources. Four years experience in agroecology, agroenvironmental policy and ecosystem health.

Robert K. Feeney, M.S.

Generated tabular data and produced figures for preliminary analysis and final EIS utilizing GRASS Geographic Information System (GIS).

Discipline/Expertise: M.S. Geography, Murray State University, 1992; B.S. Geography and Environmental Planning, Elmhurst College, 1990.

Experience: Five years in digital chartography. Three years in Geographic Information Systems development, applications and analysis. Three years experience in remote sensing technology, Mid-America Remote Sensing Center, Murray Kentucky.

Michael Hirschi, Ph.D.

Assisted in engineering aspects of soil erosion, sedimentation, water quality and soil compaction assessments as well as specification of soil erosion and sedimentation controls.

Discipline/Expertise: Associate Professor, Agricultural Engineering Department, University of Illinois; Extension Specialist of the Cooperative Service, University of Illinois. B.S. Agricultural Engineering, 1978; M.S. Agricultural Engineering, 1980; Ph.D. Agricultural Engineering, 1985.

Experience: Twelve years in soil erosion and sedimentation control research and extension in Kentucky and Illinois.

Pamela J. Hoglund, M.S.

General assistance in preparation and data source research. Preparation of description of action, Chapters 5, 6, and 7 and appendices. Incorporation of comments.

Discipline/Expertise: Environmental Research Assistant, B.A. in Marine Biology, M.S. in Biology, University of Illinois, 1991.

Experience: Five years experience in aquatic environmental monitoring and assessment, foreign fisheries teaching and marine habitat research. Two years experience in environmental, risk and hazard assessment.

David Leatherman, M.S.

Discipline/Expertise: Senior Systems Programmer at Maran Associates.
M.S. in Computer Science, University of Illinois, 1990.

Experience: Six years at the Knowledge-Based Systems Research Lab, Department of Agronomy, University of Illinois. Responsible for coordinating technical input and providing the computer code for the Nutrient management Advisory System (NUMAS) which was developed for the water quality protection program of the USDA Soil Conservation Service.

Nelson D. Lewis, Ph.D.

Prepared Environmental Noise Assessment

Discipline/Expertise: Acoustical Engineer, Ph.D., in Mechanical Engineering, University of Massachusetts, 1976. Master Consultant, U.S. Army Environmental Hygiene Agency, 1989.

Experience: Twenty years in documenting and analyzing environmental noise impacts, and preparing assessments with G.A. Russell and Associates and the U.S. Army Environmental Hygiene Agency. Chair, American National Standards Organization Working Groups on Impulsive Noise Propagation.

LaRaw Maran, Ph.D.

Discipline/Expertise: President and C.E.O. of Maran Associates, Inc.
Ph.D. in Cognitive Science, University of Illinois, 1971.

Experience: Six years director of the Knowledge-Based Systems Research Lab, Department of Agronomy, University of Illinois. During this time the Lab developed intelligent type computer programs which aid managers to make nutrient and pest management decisions for crop production and determine potential environmental impact of their decisions.

Helena Mitasova, Ph.D.

Computed digital elevation model for Camp Shelby; modeled temporal and spatial distribution of erosion risk at selected areas.

Discipline/Expertise: Ph.D. Geodetical Chartography, Slovak Technical University, Bratislava, Slovakia; GIS and environmental modeling; digital terrain models, topographic analysis and erosion modeling.

Experience: Three years in research and development of methods and programs for interpolation and analysis of surfaces for applications to environmental modeling in GRASS GIS; one year in development of methods for erosion modeling, study for environmental impact of proposed water reservoir in Central Illinois; seven years teaching and research of computer cartography and GIS at Comenius University, Bratislava, Slovakia.

Randolf D. Norris

Prepared Economic Impact Forecast System results; Prepared Appendix M; Responsible for sections on Economic Environment, Mineral Exploration and Extraction.

Discipline/Expertise: Environmental Planner, M.S. in Urban Planning, University of Illinois, 1993; B.S. in Plant and Soil Science, Southern Illinois University, 1984.

Experience: Two years experience with environmental management planning. Environmental Laboratory, U.S. Army Corps of Engineers, Construction Engineering Research Laboratories.

Jerry J. Nielsen, M.A.

Co-investigator for historic resources assessment

Discipline/Expertise: Archeology, M.A., 1971, University of Alabama, AL.

Experience: Over twenty-five years in archeological research and cultural resource management. Eighteen years with the U.S. Army Corps of Engineers.

David L. Price, Ph.D.

Supervised soils and vegetation data collection and analyses; prepared site descriptions for proposed training facilities and activities; evaluated effects of alternatives on natural resources for the DEIS and FEIS.

Discipline/Expertise: B.S. in Zoology, 1976, M.S. in Botany, 1978 from Fort Hays State University; Ph.D. in Rangeland Ecology and Management, 1985 from New Mexico State University.

Experience: Twelve years of research and teaching experience in ecological data collection, analyses, and reporting. Five years experience in research, development, and implementation of the US Army's Land Condition-Trend Analysis Program. Continuing research efforts include determining carrying capacity of Army training lands with the goal of accomplishing the military mission in conjunction with other appropriate resource use and environmental constraints. Principal Investigator, Environmental Sustainment Laboratory, U.S. Army Corps of Engineers, Construction Engineering Research Laboratories.

William A. Russell, Jr., M.S.

Prepared Enviromental Noise Assessment

Discipline/Expertise: Enviromental Protection Specialist, M.S. in Geography and Environmental Planning, Towson State University, 1991; B.S. in Natural Sciences, Towson State University, 1983; A.A. in Engineering, Harford Community College, 1973; graduate, U.S. Army Management Staff College, 1991.

Experience: Twenty years experience in analyzing and documenting the impact of U.S. Army activities on the environment with U.S. Army Aberdeen Proving Ground, MD, Headquarters Department of the Army and the U.S. Army Environmental Hygiene Agency. Member, U.S. Army Threatened and Endangered Species Research and Development Working Group, Team 7: Noise and Animal Life of the International Commission on the Biological Effects of Noise, and the U.S. Air Force Noise and Sonic Boom Impact Technology Steering Committee.

Scott Tweddale, M.S.

Primary responsibility for compiling the digital data base of Camp Shelby for use with Geographical Resources Analysis Support System (GRASS). Assisted with spatial analysis and other GIS applications in support of the project.

Discipline/Expertise: B.S. in Geography, University of Illinois, 1988, with a concentration in spatial analysis; M.S. in Geography, from the technical program (GIS-remote sensing), University of Illinois, 1991.

Experience: Three years experience in digital database development, applications support and user training. Two years experience as a GIS analyst/systems programmer.

William R. Whitworth, M.S.

Conducted small-mammal survey at Camp Shelby. Participated in selection and evaluation of supporting documents and the on-site inspection of proposed construction/training sites. Prepared discussions of present biological environment, Biodiversity, and effects of alternatives on the biological environment and biodiversity.

Discipline/Expertise: Field Biology, M.S. 1986.

Experience: Eight years experience conducting small mammal surveys. Four years of waterfowl, raptor, and pocket gopher research with emphasis on productivity and distribution. Four years experience developing, implementing, and evaluating Land Condition Trend Analysis (LCTA) wildlife inventory field methods for Army training lands. Environmental Division, U.S. Army Corps of Engineers, Construction Engineering Research Laboratory.

B. OTHER CONTRIBUTORS TO THE EIS

Cynthia A. Abrahamson, B.A.

Assisted in the development of data layers, and responsible for the classification of satellite imagery used in GIS analysis. Conducted LCTA plot allocation and developed plot information for use in the field.

Discipline/Expertise: B.A., Geography, Augustana College, Rock Island, Illinois, 1985.

Experience: Five years experience with GIS database development and maintenance, problem analysis and modeling, and systems management.

Leslie J. Benson, B.S.

Environmental noise assessment.

Discipline/Expertise: B.S., Civil Engineering, University of Illinois.

Experience: Environmental Engineer for 17 years. Principal Investigator for the Environmental Acoustics Team, Environmental Division, USACERL.

Denise Bullock, B.S.

Prepared mobility digital terrain database.

Discipline/Expertise: Computer Science and Mathematics, B.S., Mississippi State University, 1983.

Experience: Seven years experience as a mathematician and team leader developing digital terrain data to support various mobility and combat models and conducting analytical studies dealing with vehicle-terrain interactions. Geotechnical Laboratory, Mobility Systems Division, US Army Engineer Waterways Experiment Station.

Michael L. Denight, M.S.

Provided overall assistance with all phases of the development of an Environmental Awareness Program. Responsible for the review of the EA Program Strategy, scripts, handbooks, posters and field cards.

Discipline/Expertise: Biological Sciences, M.S., Illinois State University, 1979. Curriculum Development, University of Illinois, Ph.D. Candidate.

Experience: Six years experience in aquatic biology, including environmental assessment, ecology and ethology of fishes and biomonitoring. Five years experience developing environmental educational curricula for U.S. Army training installations.

J. F. Fitzpatrick, Jr., Ph.D.

Project leader for crayfish assessment.

Discipline/Expertise: Ph.D. University of Virginia 1964. Systematics and evolution of freshwater crustaceans.

Experience: Professor of Biology at the University of South Alabama. Author of numerous articles on crawfish taxonomy and of the book How to Know the Freshwater Crustacea. He has served as an officer in many regional, national, and international organizations and has been elected a Fellow of the American Association for the Advancement of Science.

Ronald H. Gilmore, B.S.

Terrain feature layers from converted TVA digital database. Provided GIS technical support throughout project.

Discipline/Expertise: Mechanical Engineering, B.S., Mississippi State University, 1979; Computer Science, B.S., Mississippi State University, 1979.

Experience: Twelve years experience in mobility research and modeling, terrain description, and digital terrain database development. Six years experience in GIS technology/analysis. Geotechnical Laboratory, Mobility Systems Division, US Army Engineer Waterways Experiment Station.

Eve E. Graham, B.S.W.

Edited Final EIS; collected and maintained files, bibliography, glossary and was responsible for editing and reformatting Volumes I and II.

Discipline/Expertise: Bachelors of Social Work, B.S.W., Valparaiso University, 1988; candidate for Masters in Urban and Regional Planning, University of Illinois.

Experience: Department of Urban and Regional Planning assistantship editing and revising a series of seismic information and education documents. One previous semester editing and revising Draft EIS for Camp Shelby at U.S. Army Construction Engineering Research Laboratory.

Dawn Janich, B.S.

Provided overall assistance in preparation of environmental awareness materials. General analysis of installation concerns and development of appropriate materials to educate soldiers on environmental compliance.

Discipline/Expertise: B.S. Anatomy, candidate for Masters in Education, University of Illinois.

Experience: Two years teaching biology at the Jr. College level; one year experience in developement of environmental awareness materials.

Patricia M. Kirby, M.P.H.

Project Coordinator. Overall coordination; general assistance in preparation of Volumes I,II and III; incorporation of comments; coordinaton of responses to comments.

Discipline/Expertise: Masters in Public Health (MPH), University of California.

Experience: Three years experience assisting with the coordination of development/public relations programs. One year experience arranging continuing-education short courses.

Robert J. Larson, M.S.

Principal Investigator for erosion impact assessment.

Discipline/Expertise: Geology (Chemistry minor), B.S., University of Wisconsin, 1965; Geology (Geochemistry minor), M.S., Michigan Technological University, 1968; Geology, Ph.D. candidate, Ohio State University.

Experience: Twenty-three years experience in teaching and research in geology and geomorphology. Site characterization, geomorphological interpretation, landform analysis, maneuver damage analysis, and solidified hazardous and toxic wastes. Geotechnical Laboratory, Earthquake Engineering and Geosciences Division, US Army Engineer Waterways Experiment Station.

Larry R. Lawrence, M.S.

Experimental design and analysis of data for survey of outdoor recreation activities in the Camp Shelby area.

Discipline/Expertise: Recreation and Parks, B.S., 1975; Natural Resources Management, M.S., 1977; Post-graduate studies in Parks, Recreation, and Tourism.

Experience: Eleven years experience with the Corps of Engineers Water Resource Projects and the Natural Resources Research Program. Principal Investigator for the work unit that developed a base line system relative to physical, environmental, social and economic characteristics of Corps water resource projects.

Charles W. Moorehead, Ph.D.

Co-investigator for Historic Resource Assessment

Discipline/Expertise: Comparative Developmental Studies, PhD. 1977, Florida State University.

Experience: Twenty years experience in historic resource management. Thirteen years with U.S. Army Corps of Engineers. Experience as staff archeologist with the University of Alabama. Served as Mobile District historian for fifteen years.

Patricia A. Morris, M.C.E.

Principal Investigator for vehicle mobility analysis; overall WES liaison/coordinator; data collection and processing of digital terrain data; analysis and preparation of results and conclusions; preparation and review of text.

Discipline/Expertise: Civil Engineering, B.S., Tulane University, 1984; Master of Civil Engineering, Mississippi State University, 1991.

Experience: Seven years experience as civil engineer researching and conducting studies in vehicle mobility prediction modeling, soil moisture-strength relationships, maneuver damage modeling and digital terrain database development. Geotechnical Laboratory, Mobility Systems Division, US Army Waterways Experiment Station.

John B. Palmerton, M.S.

Principal Investigator for groundwater drawdown analysis.

Discipline/Expertise: Physics, B.S., University of Missouri at Rolla, 1964; Geotechnical Engineering, M.S., University of California at Berkeley, 1971.

Experience: Twenty-four years experience in numerical modeling of geotechnical phenomena and field/laboratory testing equipment development. Geotechnical Laboratory, Soil and Rock Mechanics Division, US Army Engineer Waterways Experiment Station.

Monte L. Pearson, Ph.D.

Overall WES Project Manager for mobility, erosion, groundwater, and recreation analyses.

Discipline/Expertise: Geology and Education, B.S., University of Montana, 1972; Geology, M.S., University of Montana, 1978; Geomorphology, Ph.D., Oregon State University, 1986. Major, US Army.

Experience: Nineteen years experience in research and teaching in geology, geomorphology, and civil engineering. Geotechnical Laboratory, US Army Engineer Waterways Experiment Station.

Conrad P. Rabalais, B.S.

Converted Intergraph GIS digital terrain database for use with ARC/INFO GIS. Assisted with spatial analysis and other GIS applications in support of the project.

Discipline/Expertise: Electrical Engineering (Computer Option), B.S., Louisiana State University, 1986.

Experience: Five years experience in digital database development and conversion, applications programming and support, user training, and problem analysis. Geotechnical Laboratory, Mobility Systems Division, US Army Engineer Waterways Experiment Station.

Neil D. Robison, Ph.D.

Co-investigator for historic resource assessment.

Discipline/Expertise: Archeology, Ph.D. 1986, University of Tennessee, Knoxville.

Experience: Over twenty years experience in archeological research and resource management. Eleven years with the Federal Government, one year with the National Park Service and ten years with the Corps of Engineers.

Margaret A. Sabol, B.S.

Processed digital terrain data and generated plots and statistics to support analysis.

Discipline/Expertise: Computer Science, B.S., Mississippi College, 1986.

Experience: Two years experience with GIS database development and maintenance.

Irene J. Sakellarakis, M.A.

Edited EIS draft and portions of the final; revised and compiled information for chapters 5-7, collected and maintained figure files.

Discipline/Expertise: B.A. in political science, 1991; M.A. in Political Science, University of Illinois, 1993.

Experience: One semester research assistant to Agricultural Engineer at U.S. Army Construction Engineering Research Laboratiories; one semester with EIS preparer team U.S. Army Construction Engineering Research Laboratories.

Eric Schreiber, M.S.

Assisted in analyzing the impacts that the different alternatives would have, with respect to: birds and mammals; neotropical migrants; T&E species.

Discipline/Expertise: M.S. in Field Biology, Fort Hays State University, 1993.

Experience: Five years experience conducting small and medium sized mammal surveys. Three years experience with Land Condition Trend Analysis (LCTA) inventoring small mammals on seven different Army installations. Two years experience teaching Biology. Environmental Division, U.S. Army Corps of Engineers, Construction Engineering Research Laboratory.

Jon Schmidt (candidate for B.S. in Civil Engineering)

Organized public comments, contributed to editing and compiling Volume I of Shelby Final EIS.

Experience: Part time work over a three year period assisting with work on Environmental Impact Statements.

Rhonda D. Taylor, B.S.

Translated soil data from the United States Geological Survey and the US Forest Service classification system to the Unified Soil Classification System.

Discipline/Expertise: Geology (Earth Sciences minor), B.S., University of Southern Mississippi, 1985.

Experience: Six years experience in soil interpretation and analysis including extensive field experience in Germany, Switzerland, Australia, and the US.

David J. Tazik, Ph.D.

Overall direction of field studies. Ecologist and Group Leader.

Discipline/Expertise: Ph.D., Environmental Planning, University of Illinois (1991), M.S., Biology with specialization in ecology, Clarion State College, PA (1978). B.S., Biology, University of Pittsburgh, Johnstown, PA (1974).

Experience: USACERL: Ecologist and Principal Investigator at USACERL April 1987 to present. Presently coordinating research, development, and implementation of the U.S. Army's Land Condition-Trend Analysis (LCTA) Program.

Michael R. Waring, MAg.

Overall direction of Recreation Impact Analysis.

Discipline/Expertise: B.S., Wildlife and Fisheries Science, 1970; MAg, Recreation Resources Administration, 1979.

Experience: Thirteen years experience with U.S. Army Corps of Engineers projects and Army installations on recreation and environmental issues. Emphasis has been on natural resource planning and management, recreation research, and Geographic Information System (GIS) applications.

John B. White, B.S.

Coordinated Forest Service input to data layers for GIS, prepared forestry data and environmental impact analysis on forestry.

Discipline/Expertise: B.A., Forestry, University of Maine, 1986.

Experience: Thirty years of timber and other resource management with the U.S. Forest Service, U.S. Park Service, and Pennsylvania Department of Forest and Water. Four years land management planning with the U.S. Forest Service.

C. CONDUCT OF FIELD STUDIES

Paul R. Block

Assistant Field Crew Leader for EIS at Camp Shelby, MS

Discipline/Expertise: B.A., Natural Resource Management, Colorado State University.

Experience: Two years experience as research technician and associate assisting in data collection, summary and analysis.

James V. Buchanan, B.S.

Technical assistant for crayfish assessment.

Discipline/Expertise: B.S., Biology, Athens State College, Athens, Alabama. Working on Master's degree at the University of South Alabama, with special interest in biology of freshwater crustaceans, particularly cambarid crayfishes.

Experience: Involved in numerous studies concerning assessment of rare and endangered crayfish species. Current research addresses relationships between burrowing crayfish and pitcher plant bogs in the central Gulf Coastal Plain. Member of the Alabama Academy of Sciences, the Crustacean Society, and the International Association of Astacologists.

Brian R. Chapman, Ph.D.

Co-principal Investigator for assessment of red-cockaded woodpeckers.

Discipline/Expertise: Zoology, Ph.D., 1973, Texas Tech University.

Experience: Over 20 years in research and teaching of biological topics. Experience in ornithology, mammology, and wildlife management. Conducted environmental assessment with the U.S. Army and other Federal organizations. Terrestrial Zoologist in the Oklahoma Natural Heritage Inventory, with responsibility for assessment of rare and endangered species at the Oklahoma Natural Heritage Inventory, Oklahoma Biological Survey.

Randy L. Coggin

Technical assistant for crayfish assessment.

Discipline/Expertise: Undergraduate student working on a Bachelor of Science degree in Biology at the University of South Alabama.

Experience: Four years of service in the U.S. Navy, has assisted in several field studies dealing with rare and endangered species of crayfish.

William C. Dinkines, M.S.

Field crew supervisor for red-cockaded woodpecker assessment.

Discipline/Expertise: Wildlife fisheries ecology, M.S., 1990, Oklahoma State University.

Experience: Assisted with planning and organization of systematic survey for red-cockaded woodpeckers. Training in assessment of wildlife populations. Conducted research studies of wildlife on U.S. Army installations. Oklahoma Biological Survey.

Patricia Pipkin Douglas

Supervisor, Floristic Inventory Laboratory, research associate, and field crew leader.

Discipline/Expertise: Taxonomy and Systematics, B.S., 1968, Howard Payne University, To receive M.S., 1991, Colorado State University.

Experience: Twelve years teaching and research experience in Botany and Taxonomy. Supervisor of LCTA Laboratory (floristic inventory) project, Colorado State University, Taxonomist and Systematist for LCTA Project, Colorado State University. Coordinator and taxonomist for Russian Exchange Program in Colorado. Field experience over much of the U.S. and in Germany.

Paula M. Durkin

Field crew member for species survey and plot preparation at Camp Shelby, MS

Discipline/Expertise: B.S., Botany, Colorado State University.

Experience: One year of experience in conducting threatened and endangered species surveys for private consulting firms and as part of the Land Condition-Trend Analysis crew.

Rick Fry

Field crew member for assessment of red-cockaded woodpecker.

Discipline/Expertise: Naturalist and wildlife artist.

Experience: Has 25 years of experience in identifying birds and studying them in the field. Conducted population analyses on Army installations. Has considerable expertise in field identification of birds. Oklahoma Biological Survey.

Candy A Gedge, B.S.

Assisted in the collection and preparation of data and participated in the ground and aerial surveys used to locate old and new, Red Cockaded Woodpecker Cavity Sites.

Discipline/Expertise: B.S. in Biology, 1989.

Experience: Two years experience in field data collection for the Bureau of Land Management and for the U.S. Army Corps of Engineers, Construction Engineering Research Laboratory at Dugway, Utah.

Cynthia A. Hindes

Research Associate for the LCTA Laboratory.

Discipline/Expertise: B.A., 1974, Colorado State University.

Experience: Five years with the Colorado State Forest Service Tree Nursery; two years with Colorado State Seed Laboratory, performing germination and purify test on seeds; two years field surveys experience, plant identification, verification, herbarium preparation and greenhouse work for the LCTA Laboratory.

Jerome A. Jackson, Ph.D.

Consultant for red-cockaded woodpecker assessment.

Discipline/Expertise: Zoology, Ph.D., 1970, University of Kansas.

Experience: Expertise in environmental assessment and in woodpecker biology. Familiar with habitats in Mississippi. Has served as an officer in numerous ornithological societies. Extensive advisory and reviewing activities with respect to plans for endangered species, including the red-cockaded woodpecker. Consultant to the Oklahoma Biological Survey from Mississippi State University.

Mike W. McFadden

Field crew member for studies at Camp Shelby, MS

Discipline/Expertise: B.A., Horticulture, Colorado State University.

Experience: One year experience as a field crew member on Land Condition-Trend Analysis; data entry; plant inventory methods.

Eamon B. O'Regan

Assisted with rodent population study, plot allocation, and field crew leader for Camp Shelby Training Site, MS

Discipline/Expertise: B.S., Range and Forest Management, Colorado State University.

Experience: Seven years experience as research technician for Colorado State University and U.S. Forest Service; data entry and summarization.

Carlo A. Popolizio

Field crew member for floristic survey and data collection for EIS at Camp Shelby, MS

Discipline/Expertise: Master of Science, Range Science with specialization in riparian ecology, Colorado State University; Bachelor of Science, Wildlife Management with certification in range management, minor: Biology, Department of Range Animal Sciences, Sul Ross State University.

Experience: Five years experience as Research Associate and Range Technician, LCTA Laboratory, Colorado State University and Sul Ross State University.

Allen Pursell, M.S.

Assisted in collection field data concerning vegetation and soil condition.

Discipline/Expertise: Forest Ecology, M.S., Purdue University, 1989.

Gary D. Schnell, Ph.D.

Principal Investigator for assessment of red-cockaded woodpeckers.

Discipline/Expertise: Zoology, Ph.D., 1969, University of Oklahoma.

Experience: Over 25 years experience in research and teaching of ornithology, evolutionary biology, and systematics. 18 years experience in environmental assessments preparation, with background and knowledge of environmental evaluation on military installations. Expertise in statistical analysis and field techniques for environmental assessment. Director of the Oklahoma Biological Survey, Professor of Zoology at the University of Oklahoma, and Curator of Birds in the Oklahoma Museum of Natural History. Oklahoma Biological Survey.

Robert Blaine Shaw, Ph.D.

Principal Investigator of Land Condition-Trend Analysis Program at Colorado State University; coordinate LCTA data collection; and collection, identification, verification, and presentation of specimens for floristic survey.

Discipline/Expertise: Plant Ecology, Agrostology, Botany, Threatened and Endangered Plants, B.S., Southwest Texas State University; M.S., Texas A&M University; Ph.D.-Texas A&M University.

Experience: Nineteen years experience in ecology; plant collection and identification; and floristic surveys. Author of a grass systematics textbook and over 30 scientific publications. Assisted in research and development of LCTA Program methods. Involved with LCTA Program on military lands across the U.S. Research efforts include standardizing sampling techniques for threatened and endangered species on military lands, evaluation of the effects of military vehicles on vegetation, and improvement of allowable use estimated for tracked vehicular training. Department of Range Science, Colorado State University, Fort Collins, Colorado.

CONTRIBUTORS TO DRAFT EIS

Joanne D. Culbertson, M.P.P.

Preparation of description of proposed action. Responsible for sections on Description of Alternatives, Explosive Ordinance Disposal Facility, Combined Arms Livefire Exercise Assembly Area, and Tactical Aviation Area.

Discipline/Expertise: Natural Resource Policy, Masters in Public Policy, Harvard University, 1977.

Experience: More than eight years experience in coordinating natural resource policy issues at the Department of the Interior. Five years experience with public policy research at the Federal, State, and Local levels. Environmental Division, U.S. Army Corps of Engineers, Construction Engineering Research Laboratory.

Robert C. Lozar, M.L.A.

Overall direction of Geographical Analysis effort.

Discipline/Expertise: Landscape Architecture & Regional Planning, Harvard University, 1973.

Experience: Fourteen years experience in preparation of Environmental Impact Analyses with emphasis on Geographical Information Systems (GIS) technology applications, impact forecasting and tradeoff evaluation techniques, supporting guidance and documentation, management of military installation resources. Environmental Division, U.S. Army Corps of Engineers, Construction Engineering Research Laboratory.

Richard M. Marlatt, AICP, M.A.

Responsible for description of proposed actions, general back-ground and scope of study.

Discipline/Expertise: A.B. Urban and Regional Planning, 1982; M.A. Urban Planning, 1984; Post-graduate studies in Regional Planning.

Experience: Six years experience with Army installation community and environmental planning policy and issues. Significant contribution to a recent major revision of Army Regulation 200-2, "Environmental Effects of Army Actions", and an examination of functional equivalency issues between NEPA and CERCLA. Environmental Division, U.S. Army Corps of Engineers, Construction Engineering Research Laboratory.

Robert E. Riggins, M.S., P.E.

General assistance in sediment transport and erosion control studies. Development of tactical vehicle crossing design concepts.

Discipline/Expertise: M.S. in Civil Engineering ; M.S. in Environmental Engineering; Registered Professional Engineer in the State of Illinois.

Experience: Eighteen years experience at USACERL as a researcher, program manager for the Environmental Division and Team Leader responsible for R & D programs dealing with training land and natural resources management.

Muhammad Sharif, Ph.D.

Evaluation of soils, erosion conditions and erosion control practices.

Discipline/Expertise: M.S. Agricultural Engineering, 1978 - University of Georgia; Ph.D. Engineering (Soil and Water Resources), 1990 - Texas Tech University.

Experience: Twenty-two years experience in extension, research, and teaching. Five years experience in wind erosion research with USDA-ARS, five years research and teaching in soil and water resources management. One year experience in research and field implementation of structural and biotechnical soil erosion control methods at Army training lands with Environmental Division, U.S. Army Corps of Engineers, Construction Engineering Research Laboratory.

Jerry E. Thompson, M.S.

Provided overall assistance on all phases of GIS analysis

Discipline/Expertise: Resource Management, M.S. 1991.

Experience: Five years experience in Geographic Information Systems data base design, and applications. Ten years experience in Resource Policy assessment, Environmental Impact studies, resource management planning. Environmental Division, U.S. Army Corps of Engineers, Construction Engineering Research Laboratory.

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Final
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Military Training Use of National Forest Lands: Camp Shelby, Mississippi

Chapter 8

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CHAPTER 8.0 INDEX

The following entries were selected to represent topics which were believed to be either of general interest, technical interest, or were mentioned during the scoping process and the review of the Draft EIS. Those technical or jargon terms marked with an asterisk (*) are defined in the Glossary, which follows the Table of Contents.

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Final
Environmental Impact Statement

Military Training Use of National Forest Lands: Camp Shelby, Mississippi

Chapter 9

COORDINATION

CHAPTER 9.0 COORDINATION

The Draft EIS on Military Training Use of National Forest Lands, Camp Shelby, Mississippi was prepared in 1990-1991. It was filed with the Environmental Protection Agency and mailed to 681 agencies, organizations, and individuals on November 21, 1991. The notice for the Draft EIS was published in the *Federal Register* at that time. The public comment period given in that letter was from November 29, 1991 to January 28, 1992. At the request of several persons, the public comment period was extended to March 1, 1992. All comments were responded to regardless of date of receipt.

Three public meetings were held on the Draft EIS (at Jackson, Gulfport, and Hattiesburg, Mississippi) in January 1992. They were attended by a total of more than 300 persons. The questions or concerns of people attending the meetings were collected on comment sheets given out during the meeting. A court stenographer was available to record statements for people who preferred dictating their comments. Written statements prepared prior to the meetings were also accepted at that time. During the public comment period, comments on the Draft EIS were received from 321 agencies, interested organizations, and individuals. In all, more than 2,200 comments, questions, issues, or concerns were identified. Volume III of the Final EIS contains the responses to comments received on the Draft EIS.

The following persons, agencies and groups were on the Draft EIS distribution list:

Distribution List for Draft EIS

Garden Clubs of Mississippi	100 24th Street	Gulfport	MS	39530
Mississippi Archeological Association	115 Wiltshire Boulevard	Biloxi	MS	39531
Biloxi Chamber of Commerce	P.O. Box CC	Biloxi	MS	39530
Aaron, Grace		Biloxi	MS	39533
Adkins, Danny		Lucedale	MS	39452
Agregaard Jr. Sgt., Edwin A.		D'Iberville	MS	39532
Ainsworth, Dennisea		Sandersville	MS	39477
Alcorn State University,	Department of Forestry	Lorman	MS	39096
Alfaro, Ricardo		Gulfport	MS	39503
Alfaro, Victor		Gulfport	MS	39503
Alldrege, Emily		Long Beach	MS	39560
Allen, Donna		Ocean Springs	MS	39564
Allen, Jr. Mrs. Cleve		Gulfport	MS	39501
Allin, Judith A.		Biloxi	MS	39532
Almquist, Bryon		New Orleans	LA	70119
Anderson, John W.		Richton	MS	39476
Anderson, Mark		Hattiesburg	MS	39401
Anderson-Tully Co.	1242 N Second St	Memphis	TN	38103
Anglin, Elizabeth		Hattiesburg	MS	39401
Aultman, Tim		Petal	MS	39465
Austin, Karen		Hattiesburg	MS	39401
Auter, Don		Petal	MS	39465
Autry, Lanny L.	Mid-South Forestry, Inc Box 823	New Albany	MS	38652
Backe, Paul		Bay St. Louis	MS	39520
Backstrom, O		Gulfport	MS	39507
Bagley, Fred A.	U.S. Fish and Wildlife Service 300 Woodrow Wilson, Suite 3185	Jackson	MS	39213
Bailey, James Andrew	Weyerhauser Co. Box 577	Bruce	MS	38915
Baker, Larry		Brandon	MS	39042
Baldwin, Jack L.		Hattiesburg	MS	39401

Barber, Gerald		Jackson	MS	39215
Barefield, Stone		Forrest	MS	39074
Barneycastle, Chris		Forrest Park	GA	30051
Barr, Dexter		Hattiesburg	MS	39401
Batson, Brax		Wiggins	MS	39503
Batte and Sons, Jack		Forest	MS	39074
Baucum, Lance		Wiggins	MS	39577
Bean, Jr. The Honorable James L.		Hattiesburg	MS	39401
Beasley, Maybelle		Jackson	MS	39206
Beason, Kim		University	MS	38677
Beaugez, Donna		Ocean Springs	MS	39564
Beaugez, Gary		Ocean Springs	MS	39564
Becker, Carolyn		Hattiesburg	MS	39401
Behan, John M.	Columbus Lumber Co Box 536	Brookhaven	MS	39601
Bell, Don		Bruce	MS	38915
Bell, Louise R.		Gulfport	MS	39507
Ben, Patrick		Brooklyn	MS	39425
Bentley, Glaydette		Gulfport	MS	39501
Bethea, Jack		Gulfport	MS	39564
Bevill, Vernon	MS Department of Wildlife, Fisheries and Parks P.O. Box 451	Jackson	MS	39205
Bills, Cleveland		Hattiesburg	MS	39401
Black Creek Canoe Rental	P. O. Box 414	Brooklyn	MS	39425
Blair, Joyce		Wiggins	MS	39577
Blair, Stanley		Wiggins	MS	39577
Blalock, Lee		Perkinston	MS	39573
Blount, Darrell		Hattiesburg	MS	39401
Boatwell, A.D.		Soso	MS	39480
Bond, Edward		Perkinston	MS	39573
Boone, Tom		Gautier	MS	39563
Boone, Edna		Ocean Springs	MS	39564
Bosarge, Robert		Moss Point	MS	39563
Boudreaux, Fred		Hattiesburg	MS	39402
Bounds, Hal		Hattiesburg	MS	39401
Bowen, Richard		Hattiesburg	MS	39406
Bowling, Dale R.		Laurel	MS	39440
Bowling, Dale		Laurel	MS	39440
Boyd, Randy P.	Westvaco Corp Box 933	Tupelo	MS	38802
Boyd, Gary Price	Union Camp Corp Box 87	Baxley	GA	31513
Bradley, Beth and Dan		Gulfport	MS	39503
Bradshaw, Dwight		Waveland	MS	39529
Branche, PE, Charles T.	Dept. of Agriculture & Commerce P. O. Box 1609	Jackson	MS	39205
Braswell, Janet		Hattiesburg	MS	39401
Breland, Jackey		Beaumont	MS	39423
Breland, Hubert and Maragite		Hattiesburg	MS	39401
Brenke, Jr. Charles		Vancleave	MS	39564
Brent, Dr. Charles	USM Institute of Env. Science 206 Velma Street	Hattiesburg	MS	39401
Brewer, Franklin		Wiggins	MS	39577
Brewer, Jason and Earl		Moss Point	MS	39563
Broach, Walter L.		Pass Christian	MS	39571
Broome, Teresa		Hattiesburg	MS	39401
Brown, Johnny		Purvis	MS	39475
Brown, Wilford		Hattiesburg	MS	39402
Bryant, James		Brooklyn	MS	39425
Buckley, John		Hattiesburg	MS	39401
Bullard, Steven		Starkville	MS	39762
Bumgardner, Dr.	USM Dept of Human Performance & Recreation South Station 1542	Hattiesburg	MS	39406

Burchell, Dr.	USM Dept. of Human Performance & Recreation South Station 1542	Hattiesburg	MS	39406
Bureau of Pollution Control	Director, MS Dept. of Environmental Quality P.O. Box 10385	Jackson	MS	39209
Bureau of Recreation and Parks	Director, MS Dept of Natural Resources P.O. Box 10600	Jackson	MS	39209
Burke, Shelia		Biloxi	MS	39530
Burril, Mrs. C. F.		Pass Christian	MS	39571
Buskirk, Ron	Gulf Coast Group Sierra Club 2115 Boardman Blvd.	Gulfport	MS	39507
Butler, Steve M.	Deposit Guaranty Natl Bank Box 1200	Jackson	MS	39205
Byrd, Malcolm		Petal	MS	39465
Caillavet, Bayne		New Augusta	MS	39462
Cain, Wayne		Hattiesburg	MS	39401
Cake, Dr. Ed		Gulfport	MS	39503
Cake, Dr. Edwin W.	Gulf Coast Regional Consv. Com. P. O. Box 176	Ocean Springs	MS	39564
Callahan, Deborah		Hattiesburg	MS	39401
Campbell, Ellen G.		Clinton	MS	39056
Canon, Jesse		Gulfport	MS	39507
Carley, Mike		Hattiesburg	MS	39401
Carlton, Neely		Hattiesburg	MS	39406
Carnahan, Darlene		Beaumont	MS	39423
Carpenter, Ben, Preston and Beau		Wiggins	MS	39577
Carr, John R.	Ratson Wood Products, Inc. P.O. Box 236	Valley Park	MS	39177
Carrigan, Paula		Gulfport	MS	39503
Carrigan, Charles		Gulfport	MS	39503
Carter, Dolphus (Buster)		Ocean Springs	MS	39564
Carter, Kent		Hattiesburg	MS	39401
Carter, Andrew		Hattiesburg	MS	39401
Chandler, John		Biloxi	MS	39531
Clark, Kyle		Gulfport	MS	39507
Clark, Charles		Ocean Springs	MS	39564
Cleveland, Dr. Joan		Bay St. Louis	MS	39520
Clinkscales, William H.	Delta Conservation League P.O. Box 180	Delta City	MS	39061
Clinton, Phillip		Hattiesburg	MS	39401
Clinton, Debbie		Hattiesburg	MS	39401
Coachys, Rich		Hattiesburg	MS	39402
Coast Audubon Society	c/o Uevin Howe 9532 Red Bluff	Ocean Springs	MS	39564
Coast Guard Headquarters	400 7th Street, S.W.	Washington	DC	20591
Coccaro, John	Cooperative Extension Service	Rolling Fork	MS	39159
Cochran, The Honorable Thad	U.S. Senate	Washington	DC	20510
Cochran, Luther		Petal	MS	39465
Cole, The Honorable Dorthy G.		Picayune	MS	39466
Colie, Stuart		Ocean Springs	MS	39564
Collins, Bill		Biloxi	MS	39532
Collins, Leonard		Gulfport	MS	39507
Collins, Terese		Biloxi	MS	39530
Collins, Mark		Hattiesburg	MS	39401
Combs, Ken		Gulfport	MS	39502
Commander, 8th Coast Guard District	Hale Boggs Federal Bldg. 500 Camp Street	New Orleans	LA	70130
Conway Pole and Piling Co.	P.O. Box 162	New Augusta	MS	39462
Cook, Ronnie		D'Iberville	MS	39532
Cooley, Richard and Deborah		Brooklyn	MS	39425
Coordinator, Federal-State-Local Programs	Office of the Governor 1304 Sillers Bldg	Jackson	MS	39201

Copeskey, Jeff		Jackson	MS	39202
Corbitt, Steve	MS Forestry Association, Inc. 620 N State St, Suite 201	Jackson	MS	39202
Coryard, Mr. & Mrs. J. F.		Gulfport	MS	39503
Cotten, Milam S.		Hattiesburg	MS	39402
Covington, Nell		Enterprise	MS	39330
Cowan, Vincent		Hattiesburg	MS	39401
Crawford, Ted		Hattiesburg	MS	39401
Creech, Lloyd and Mary		Gulfport	MS	39501
Crosby, Cary		Long Beach	MS	39560
Crowege, Chris		Long Beach	MS	39560
Crump, Dwayne		Jackson	MS	39202
Crumpler, Harry		Petal	MS	39465
Dale, Fred		Ocean Springs	MS	39504
Dale, M.A.		Pascagoula	MS	39402
Dana, Thomas F.		Lumberton	MS	39455
Daniels, Robert		Hattiesburg	MS	39402
Darling, O H	Georgia-Pacific Corp Box 520	Crossett	AR	71625
Darras, Thomas and Linda		Hattiesburg	MS	39402
Dauro, David		Long Beach	MS	39560
Davis, Mrs. Iddo L.		Brookhaven	MS	39601
Davis, Clyde	Jackson Audubon Society 4626 Hazelwood Drive	Jackson	MS	39211
Davis, Thomas		Laurel	MS	39440
Davis, Manes T.		Ocean Springs	MS	39654
Davis, Edward		Soso	MS	39480
Davis, Dena L.		Ocean Springs	MS	39564
Davis, Bruce		Wiggins	MS	39577
Dawkins, M. S.		Ocean Springs	MS	39564
Delk, Charles and Rosemary		Gulfport	MS	39507
Denehie, Doug		Ocean Springs	MS	39564
Dennis, Walter B.	South Central Region, I.P. Co. Box 999	Natchez	MS	39120
Denton, Walter		Brooklyn	MS	39425
Denton, Dr. Virgina		Brooklyn	MS	39425
Denton, Denny		Brooklyn	MS	39425
Denton, Lucy		Hattiesburg	MS	39401
Dilalla, Dr. Vincenzio		Gulfport	MS	39507
Director, NOAA	Ecology & Environment Conservation Office, Room 6222 14th & Constitution Ave. N.W.	Washington	DC	20230
Director, Bureau of Geology	MS Dept of Environmental Quality P.O. Box 5348	Jackson	MS	39216
Director, Executive, MS State Port Authority at Gulfport	P.O. Box 40	Gulfport	MS	39502
Director, Executive, MS Dept of Environmental Quality	P.O. Box 20305	Jackson	MS	39201
District Engineer	Federal Highway Administration Dept. of Transportation 666 North Street, Suite 105	Jackson	MS	39202
Divic, M. Vic		Jackson	MS	39211
Dodds, Ross		Hattiesburg	MS	39401
Doolittle, Mr. and Mrs. H. L.		Gulfport	MS	39501
Dorris, Percy C.	Westvaco Corp Box 1085	Tupelo	MS	38802
Dorris, Percy		Tupelo	MS	38802
Doty, John D.	Monticello Hardwood, Inc Box 1069	Monitcello	MS	39654
Droddy, Dodie		Pass Christian	MS	39571
DRTR, OFF/ENV Project Review	Office of the Secretary Dept. of the Interior Rm. 4536	Washington	DC	20240
Durrwachter, Sonja		Wiggins	MS	39577
Dye, Gene		Petal	MS	39465

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Dykes, Willis		Petal	MS	39465
Ebner, Sharon		Biloxi	MS	39535
Edhe, Jr., Martin	William Carey College 1856 Beach Dr.	Gulfport	MS	39507
Elam, William	School of Forest Resources MSU, Drawer FR	Mississippi State	MS	39762
Ellard, Dr.	USM Dept. of Human Performance & Recreation South Station 1542	Hattiesburg	MS	39406
Elmore, James		Brandon	MS	39042
Engram, Robert		Gulfport	MS	39503
Environment and Standards Office	Assist Reg Administrator for CPD Dept of HUD, Region IV Richard B. Russell Federal Bldg. 75 Spring Street, S.W.	Atlanta	GA	30303
Environmental Compliance	Southeast Regional Office Heritage Conservation and Recreation Service 75 Spring Street	Atlanta	GA	30303
Environmental Compliance	Southeast Regional Office National Park Service Richard B. Russell Federal Bldg 75 Spring Street	Atlanta	GA	30303
Environmental Protection Agency	Mail Code A-104 Room 2119 401 M Street SW	Washington	DC	20460
Eppling, Charles		Hattiesburg	MS	39401
Eshee, Jr., William D.		Starkville	MS	39759
Espy, The Honorable Mike	House of Representatives	Washington	DC	20515
Estes, Larry		Jackson	MS	39206
Evans, Mrs. H.T.		Laguna Beach	FL	32407
Executive Director	Advisory Council on Historic Preservation 1522 K Street, N.W.	Washington	DC	20005
Faeser, Richard S.		Biloxi	MS	39532
Fairchild, Mark		Hattiesburg	MS	39402
Fairley, James		Petal	MS	39465
Farlon, Harold		New Augusta	MS	39462
Farris, A.B.	Morton Mfg Co., Inc Drawer K	Morton	MS	39117
Farris, Scott		Hattiesburg	MS	39401
Fatardo, Louis		Hattiesburg	MS	39401
Fayard, Mike		Biloxi	MS	39532
Federal Aviation Administration, Director	ATTN: Chief, Planning & Appropriations Staff P.O. Box 20636	Atlanta	GA	30320
Fields, Rod		Ocean Springs	MS	39564
Fillingane, Dan		Brooklyn	MS	39425
Fokakis, John		Hattiesburg	MS	39401
Ford, Jean		Hattiesburg	MS	39401
Forman, Eddie		Gloster	MS	39638
Fowler, Doss		Hattiesburg	MS	39401
Freeman, Jean		Hattiesburg	MS	39401
Friesema, H. Paul	Center for Urban Affairs & Policy Research 2040 Sheridan Road	Evanston	IL	60201
Gaddis, Debbie	% International Paper Co PO Box 412	Canton	MS	39046
Garner, John H.		New Augusta	MS	39462
Gartin, Bill	The Governor's Office Box 139	Jackson	MS	39205
Gates, Terrie		Purvis	MS	39475
Gautier, Warren		Pascagoula	MS	39567
Georgia Pacific/Rex Timber Co	P. O. Box 555	Taylorsville	MS	39168
Geraci, John		Purvis	MS	39475

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Gibbs, Pat & Terry		Laurel	MS	39440
Gibson, Charles		Petal	MS	39465
Giliberti, Joseph		Hattiesburg	MS	39401
Gill, Deputy Director, Mr. Joe	Bureau of Marine Resources Dept of Wildlife, Fisheries & Parks 2620 Beach Boulevard	Biloxi	MS	39531
Gillespie, Sara		Hattiesburg	MS	39401
Gillialand, William		Jackson	MS	39296
Gillie, Kim		Brooklyn	MS	39425
Gillie, Marie		Brooklyn	MS	39425
Gillie, Doris		Brooklyn	MS	39425
Gillie, Nathan		Brooklyn	MS	39425
Gillie, Neil		Hattiesburg	MS	39401
Gillie, Louis		Hattiesburg	MS	39401
Gillie, Doris		Brooklyn	MS	39425
Gillie, Sr. , Louis L.		Brooklyn	MS	39425
Gilpin, Michael		Hattiesburg	MS	39401
Gordon, Mrs. Hylma		Hattiesburg	MS	39402
Gordon, Ken,	MS Natural Heritage Program 111 N. Jefferson St.	Jackson	MS	39201
Gordon, Hylma		Hattiesburg	MS	39401
Gorsey, John		Ocean Springs	MS	39564
Graham, Randy		Laurel	MS	39440
Graham, William		Hattiesburg	MS	39401
Graves, Olivia		Saucier	MS	39574
Grayson, Edna		Hattiesburg	MS	39402
Green, Charles		Jackson	MS	39201
Green, John		Hattiesburg	MS	39401
Groce, Ronald E.		Gulfport	MS	39501
Guess, Alan		Biloxi	MS	39532
Guice, Reed		Biloxi	MS	39535
Guice, John		Hattiesburg	MS	39402
Gulf Lumber Co	Box 1663	Mobile	AL	36633
Guyton, Earnie		Hattiesburg	MS	39401
Hadwell, Ronnie		Biloxi	MS	39532
Hall, Larry		Hattiesburg	MS	39402
Hamilton, Cynthia		Pascagoula	MS	39567
Hamilton, Wallace		Petal	MS	39465
Hamon, Bill		Purvis	MS	39475
Hankins, David L	Hankins Lumber Co, P.O. Box H	Grenada	MS	38901
Hardin, James		Biloxi	MS	39532
Hariel, Ron		Perkinston	MS	39573
Harmer, R. G.		Pass Christian	MS	39571
Harper, William & Martha		Biloxi	MS	39530
Harvill, DC		Waveland	MS	39576
Harwell, J. E.		Ocean Springs	MS	39564
Harwell, Robert		Biloxi	MS	39533
Harwell, Jr. Ronnie		Biloxi	MS	39532
Hasten, Lora		Ocean Springs	MS	39564
Hasten, John C.		Ocean Springs	MS	39654
Hastert, Jr. Jesse M.		Gulfport	MS	39501
Havens, Peter	Engineering Field Activity Northwest CODE 09EP 3505 Anderson Hill Road	Silverdale	WA	98383
Heath, Jim		Jackson	AL	36545
Hensen, Dan		Ocean Springs	MS	39564
Henwood, Dr. Terry	Protected Species Branch NMFS Duval Bldg 9450 Koger Boulevard	St. Petersburg	FL	33702
Herbert, Mrs. J. C.		Shaw	MS	38773
Heriot, Dr. Jean		Hattiesburg	MS	39401
Herndon, Ernest	% Enterprise Journal Box 910	McComb	MS	39638

Herring, Jack	Division of Wildlife & Fisheries P.O. Box 451	Jackson	MS	39205
Hicks, Bob		Gulfport	MS	39502
Hill, Edward	HQ FORSCOM FCEN-RDE Building 704	Ft. Gillem	GA	30050
Hill, Sara		Hattiesburg	MS	39401
Hill, Jr. Edgar Y.		Summit	MS	39666
Hilliard, Elbert	MS Dept of Archives & History Box 571	Jackson	MS	39205
Hinkle, Sharon		Gulfport	MS	39507
Hirsch, Peter and Joan		Ocean Springs	MS	39564
Hirsch, Peter J.		Ocean Springs	MS	39564
Holladay, Robert Lawson		Drew	MS	38737
Honnold, Douglas L.	Sierra Club Legal Defense Fund 1631 Glenarm Place, Suite 300	Denver	CO	80202
Hoper, Robert		Gulfport	MS	39501
Hopstien, Rick		Hattiesburg	MS	39401
Horhn, John	Tourism and Development Div P O Box 849	Jackson	MS	39205
Houtz, G. W.		Gulfport	MS	39566
Howell, T.L. and Chris		Hattiesburg	MS	39402
Howse, Dr. Harold D.	Director, Gulf Coast Research Lab P.O. Box AG	Ocean Springs	MS	39564
Hudson, Tom	Sierra Club 1602 Linden Place	Jackson	MS	39202
Hughes, Jess		Hattiesburg	MS	39401
Hutto, C. W., Elsie, and A.C.		Gulfport	MS	39501
Jackson State University	School of Science & Technology	Jackson	MS	39217
James, Curtis	U.S. Fish and Wildlife Service 900 Clay Street, Room 235	Vicksburg	MS	39180
Jarrell, Robert P.		Hattiesburg	MS	39401
Jarrell, Joey		Hattiesburg	MS	39401
Jarrell, Robert		Hattiesburg	MS	39401
John, Morgan		Hattiesburg	MS	39401
Johnson, Robert		Saucier	MS	39574
Johnson, Bob		Hattiesburg	MS	39402
Johnson, Charles		Hattiesburg	MS	39402
Johnson, Billy Ray		Biloxi	MS	39532
Johnson, Candance		D'Iberville	MS	39532
Johnston, Earnestine		Beaumont	MS	39423
Jones, Neal		Biloxi	MS	39531
Jones, Roger	% Nature Conservancy MS Office P. O. Box 1028	Jackson	MS	39215
Jones, Willis		Petal	MS	39465
Jones, The Honorable William H.		Petal	MS	39465
Jones, Dr. James I.	MS-AL Sea Grant Consortium Caylor Building Gulf Coast Research Laboratory	Ocean Springs	MS	39564
Jordan, Ronald		Biloxi	MS	39531
Jordan, Freddie		Jackson	MS	39201
Jordan, William		Purvis	MS	39475
Jordan, Jr., Pringle		Moss Point	MS	39563
Joyner, Tommy W.	Georgia-Pacific Corp Box 555	Taylorsville	MS	39168
Keenan, Jeannette		Long Beach	MS	39560
Keenan, C. T.		Long Beach	MS	39560
Keene, Mike		Forrest	MS	39074
Kemmerer, NOAA, Dr. Andrew	National Marine Fisheries Service SE Regional Office, Region 2 Duval Bldg., 9450 Koger Blvd	St. Petersburg	FL	33702
Keppner, Dr. Edwin	National Marine Fisheries Service Environmental Assessment Branch 3500 Delwood Beach Road	Panama City	FL	32407

Distribution List for Draft EIS

Kerr, Carol		Waveland	MS	39576
Kimbrough, Dan		Pearl	MS	39208
King, Dr. John	Division of Parks and Recreation P.O. Box 451	Jackson	MS	39205
King, Barry		Gulfport	MS	39503
Kornman, Pam		D'Iberville	MS	39532
Kornman, Connie		D'Iberville	MS	39532
Kulick, Bill		D'Iberville	MS	39532
Kulick, Patricia		Ocean Springs	MS	39564
Lacey, Mrs. Thomas C.	The Garden Clubs of MS, Inc.	Holly Springs	MS	38635
Lack, John		Jackson	MS	39208
Ladner, Vincent		Gulfport	MS	39503
Lagarde, Chris	c/o The Honorable Gene Taylor 1225 Jackson Avenue	Pascagoula	MS	39567
Laird, Carrie	245 E. Capitol Street Room 226	Jackson	MS	39201
Lamb, Edwin		Brooklyn	MS	39425
Lambert, The Honorable Paul Richard		Hattiesburg	MS	39401
Landrum, Dwaine		Pascagoula	MS	39567
Landrum, W.		Petal	MS	39465
Langston, Jr. Carlos		Jackson	MS	39401
Lawson, Danny		Gulfport	MS	39503
Lee, Billy		Hattiesburg	MS	39401
Lee, Bill		Wiggins	MS	39577
LeFan, Buster	Two Wheel Drive Hunting Club 136 Northwest Circle	Hattiesburg	MS	39401
Leger, Gratia		Gulfport	MS	39506
Leopold, Dr Bruce	Dept of Wildlife & Fisheries P. O. Drawer LW	Mississippi State	MS	39762
Letchworth, Charles		Hattiesburg	MS	39401
Leubecker, Mr. Daniel	Code 840, Room 7328 Maritime Administration Department of Transportation 400 7th Street, S.W.	Washington	DC	20590
Lewis, J. Tipton		Jackson	MS	39205
Lewis, Leighton		Hattiesburg	MS	39404
Libbey, Don	U.S. Bureau of Land Management 300 Woodrow Wilson, Suite 326	Jackson	MS	39213
Lilly, Donna		Ellisville	MS	39437
Lloyd, Susan		Rolling Fork	MS	39159
Long, Karen		Pass Christian	MS	39571
Loper, Gary		Gulfport	MS	39501
Loper, Kerry		Gulfport	MS	39501
Lorch, William		Hattiesburg	MS	39401
Lott, The Honorable Trent	U.S. Senate	Washington	DC	20510
Lott, Alfred		New Augusta	MS	39462
Lott, Margaret		Hattiesburg	MS	39401
Low, David		Hattiesburg	MS	39401
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Lowery, Tom	Forrest County Agricultural High School P. O. Box 9	Brooklyn	MS	39425
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The circulation of a Summary of the Final EIS is permitted according to 40 CFR 1500.4(h) and 1502.19(d), in an effort to reduce paperwork and expense. These federal regulations also require that full copies of the Final EIS be sent to appropriate agencies and members of the public who provided substantive comments on the Draft EIS. Copies of the Final EIS have been provided to numerous Mississippi public libraries, including those in Jackson, Hattiesburg, Pascagoula, Gulfport, Biloxi, Bay St. Louis, Wiggins, Beaumont, McLain, New Augusta, and Laurel, as well as college libraries at University of Southern Mississippi (Hattiesburg), Mississippi State University (Starkville), and University of Mississippi (Oxford). The complete mailing list of libraries to which full copies of the three-volume EIS was sent follows:

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The Library	(Hattiesburg, Petal, Forrest County) 723 Main Street	Hattiesburg	MS	39401
University of Southern Mississippi	Cook Library P. O. Box 5053	Hattiesburg	MS	39406
Beaumont Public Library		Beaumont	MS	39423
Lauren - Jones Library Association	530 Commerce Street	Laurel	MS	39440
Stone County Library	242 Second Street	Wiggins	MS	39447
McLain Public Library	River Avenue	McLain	MS	39456
New Augusta Public Library		New Augusta	MS	39462
Pearl River Community College	Library Station A, P. O. Box 5060	Poplarville	MS	39470
Gulfport-Harrison County Library	P. O. Box 4018	Gulfport	MS	39502
MS State Port Authority of Gulfport	P.O. Box 40	Gulfport	MS	39502
Hancock County Library System	312 Highway 90	Bay St. Louis	MS	39520
Biloxi Public Library	139 Lameuse Street	Biloxi	MS	39530

Distribution List For Full Final EIS

	MS Gulf Coast Community College	Library P. O. Box 47	Perkinston	MS	39573
	Mississippi State University	Mitchell Memorial Library P. O. Box 5408	Mississippi State	MS	39762
Allen	Donna	1408 Sycamore Street	Ocean Springs	MS	39564
Bagley	Fred A.	USFWS, Ste. A 6578 Dogwood View Pkwy	Jackson	MS	39213
Bethea	Jack	622 2nd Street	Gulfport	MS	39501
Bowen	Richard	Box 8152 USM	Hattiesburg	MS	39406
Braswell	Janet	P.O. Box 1111	Hattiesburg	MS	39401
Breland	Hubert and Margarite	400 S. 32nd Avenue	Hattiesburg	MS	39401
Breland	Jackey W.	P.O. Box 132	Beaumont	MS	39423
Brewer	Jason and Earl	5100 Elder Street	Moss Point	MS	39563
Bumgardner	Dr.	South Station 5142	Hattiesburg	MS	39406
Burchell	Dr. Charles	South Station 5142	Hattiesburg	MS	39406
Cake	Dr. Edwin W.	Gulf Coast Regional Consv. Com. 2510 Ridgewood Road	Ocean Springs	MS	39564
Cochran	Honorable Thad	188 E. Capitol Street, Ste.614	Jackson	MS	39201
Cochran, SCS	Christopher	2000 E. Allen Road, Bldg #320	Tuscon	AZ	85719
Collins	Terese	1270 Kensington Drive	Biloxi	MS	39530
Commander	8th Coast Guard District	Hale Boggs Federal Bldg. 500 Camp Street	New Orleans	LA	70130
Conrad	Col. (R) Chris	8502 Heather Point Drive	Springfield	VA	22152
Conville	Mr. Richard L.	205 South Hampton Rd.	Hattiesburg	MS	39401
Conway, East. Ar. Con. Off.	MAJ	Marine Corps Bases-Bldg 63	Camp Le Jeune	NC	28542
Coogan, NMFS	Colleen	9721 Exec. Ctr. Dr. N.	St. Petersburg	FL	33702
Denton	Walter, Virginia, and Denny	P.O. Box 219	Brooklyn	MS	39425
Dodds	Ron	505 Front Beach	Ocean Springs	MS	39564
Doe	LTC William	Dept. of Geography & Envir. Eng. U.S. Military Academy	West Point	NY	10996
Drake	Dr. Betty	Armed Forces Museum Bldg 360	Camp Shelby	MS	39407
Duckworth	Joe D.	1211 West College Ave	Wiggins	MS	39577
Ebersol, Off. of General Counsel	John	USDA-Forest Service, R8 401 W. Peachtree St., Ste.1015	Atlanta	GA	30365
Ebert, Camp Ripley	John	P.O. Box 348	Little Falls	MN	56345
Egger	Frank N.	305 Airport Rd.	Picayune	MS	39466
Espy, Sec. of Agricul.	Honorable Mike	Administration Building, Room 200A 14th Street and Independence Avenue	Washington	D.C.	20250
Felder	Mr. Richard	308 2nd Ave.	Hattiesburg	MS	39401
Fordice	Governor Kirk	Office of the Governor P.O. Box 139	Jackson	MS	39215
Gates	Terrie and Larry	Rt. 3 Box 275C5 47 Brewer Road	Purvis	MS	39475
Gill, Dep. Dir.	Mr. Joe	2620 Beach Boulevard	Biloxi	MS	39531
Gordon	Ken	MS Natural Heritage Program 111 N. Jefferson St.	Jackson	MS	39201
Hanks	Wesley	431 Grange Hall Road	Vicksburg	MS	39180
Harrington	Dr. E. Larry	Box 8242	Hattiesburg	MS	39406
Hemingway	George	USDA-Forest Service, R8 1720 Peachtree Road, NW	Atlanta	GA	30367
Herbert	(Mrs. J. C.) Nona	Rt 2 (Choctaw) Box 146	Shaw	MS	38773
Howell	T.L. and Chris	1206 Estelle Street	Hattiesburg	MS	39402
Howse, Dir.	Dr. Harold D.	P.O. Box AG	Ocean Springs	MS	39564
Jackson-George	Regional Library System,	3214 Pascagoula Street	Pascagoula	MS	39567
James	Curtis	USFWS, Rm 235 900 Clay St.	Vicksburg	MS	39180
Johnson, Forest Sup.	Mr. Kenneth R.	100 W. Capitol St., Suite 1141	Jackson	MS	39269
Kaskey	Joe	1316 14th Street	Plano	TX	75074
Kulick	William	P.O. Drawer 4969	Biloxi	MS	39535
Lechner, Jr.	Phil	387 Belvedere Cr.	Biloxi	MS	39531
Lee	J.D and Donna	581 Leeville Road	Petal	MS	39465
Lee, Env. Officer	Mr. James H.	USDOI, Off. of Envir. Affairs 1875 Century Boulevard	Atlanta	GA	30345
Lentz, Chairman	Dr. David L.	P.O. Box 4335	Jackson	MS	39296
Leubecker	Mr. Daniel	Maritime Admin., USDOT 400 7th St., SW, Code 840, Rm 7328	Washington	D.C.	20590
Library	Jones County Junior College		Ellisville	MS	39437
Library	MS Gulf Coast Comm. College	Jefferson Davis Campus	Gulfport	MS	39501
Library	MS Gulf Coast Comm. College	Jackson County Campus	Gautier	MS	39553
Loper	Robert L.	1210 35th St.	Gulfport	MS	39501
Loper	Kerry	1126 35th Street	Gulfport	MS	39501
Lott	Honorable Trent	3100 S.Pascagoula St.	Pascagoula	MS	39567
Lowrance	Sanna Fortson	108 South 20th Ave.	Hattiesburg	MS	39401
Mallette	Cathy	301 W. Pearl Street	Jackson	MS	39203
Martin	Mr. Richard	P.O. Box 98000	Baton Rouge	LA	70898
Mather	Bryant	213 Mt. Salus Drive	Clinton	MS	39056
McCardle	Wayne	232 Pearce Rd.	Hattiesburg	MS	39401
McCay	John M.	1626 19th Avenue	Gulfport	MS	39501
McDaniel	Dr. Sidney	Inst. Botanical Explor. Box EN	Mississippi State	MS	39762
Montgomery	Honorable G.V. (Sonny)	P. O. Box 5618	Meridian	MS	39301
Mucha	Ronald	14 Cedarwood Ln, Rt 9	Gulfport	MS	39503
Mueller, Chief EPS	Mr. Heinz	USEPA, Region IV 345 Courtland St., NE	Atlanta	GA	30365
Mueller, Field Sup.	Mr. Allan J.	900 Clay Street, Room 235	Vicksburg	MS	39180
Parker	Honorable Mike	230 So. Whitworth Street	Brookhaven	MS	39601
Payne	Robert L.	Post Office Box 1803	Ocean Springs	MS	39564
Pitts	Thomas	341 McCaughan Ave.	Long Beach	MS	39560

Distribution List For Full Final EIS

Polles, Ex. Dir.	Dr. Sam	Miss. Dept. of Wild., Fish. & Parks P.O. Box 451	Jackson	MS	39205
Puckett, Pres	Dr. James F.	P.O. Box 16863	Hattiesburg	MS	39404
Reid, Pres	Ms. Elberta G.	2616 Mountain Brook Pkwy	Birmingham	AL	35223
Rogers	James A.	417 Walnut Street	Hattiesburg	MS	39401
Rooks, Ex. Dir.	Ms. Elizabeth	P.O. Box 1814	Jackson	MS	39215
Scott	Susan	105 Beverly Lane	Hattiesburg	MS	39402
Seyfarth	Robert H.	MS Dept. of Envir. Quality P.O. Box 10385	Jackson	MS	39289
Seyffert	Mr. John	Federal Emergency Management Agency 500 C Street, SW, Rm 713	Washington	D.C.	20573
Shows	Ernie and Tammy	Route 6, Box 1027	Hattiesburg	MS	39401
Simmons	Richard G.	P.O. Box 1507	Hattiesburg	MS	39402
Sirmon	Gene A.	Mississippi Federal Timber Council 620 N. State St., Ste. 210	Jackson	MS	39202
Sledge, State Forester	James L.	301 N. Lamar St. Ste. 300	Jackson	MS	39201
Small, Dir. of Lands	Gordon H.	USDA, Forest Service P.O. Box 96090	Washington	D.C.	20090
Smistik	Robert	P.O. Box 564	Wiggins	MS	39577
Smith	Floycille		Brooklyn	MS	39425
Taylor	Honorable Gene	2424 - 14th Street	Gulfport	MS	39501
Thompson	Honorable Bennie G.	107 W. Madison Street	Bolton	MS	39041
Tomasovsky	Gerald	118 Fern Valley Road	Brandon	MS	39042
Trahan	Joan	414 Oaklawn Place	Biloxi	MS	39530
Van Aller	Robert	3004 Raphael Dr	Hattiesburg	MS	39401
Walters	Larry	1999 Hwy 29	Brooklyn	MS	39425
Whitten	Honorable Jamie L.	Post Office Building	Charleston	MS	38921
Windham	Jerry and Doris	14 Bonaparte Street	Brandon	MS	39042
Wiygul	Robert	4th Floor 400 Magazine St.	New Orleans	LA	70130
Zimmerman	Mr. Carl	1801 Gulf Breeze Parkway	Gulf Breeze	FL	32561

The following is a list of agencies, organizations, and individuals to which the Summary of the Final EIS was mailed:

Distribution List For Summary of Final EIS

	Coor, Fed-St-Local Programs	1304 Sillers Bldg	Jackson	MS	39201
	Jackson State University	School of Science & Technology	Jackson	MS	39217
	Director, Dept.of Env. Qual.	P.O. Box 10385	Jackson	MS	39289
	Black Creek Canoe Rental	P. O. Box 414	Brooklyn	MS	39425
	Garden Clubs of Miss.	100 24th Street	Gulfport	MS	39503
40th Ord Det (BOD)	Commander	Box 17314	Hattiesburg	MS	39404
Abernathy	Mr. Eugene B.	34 Williamsburg St.	Starkville	MS	39759
Adams	Mrs. Aubrey	Rt. 1 Box 342 Aa	Carthage	MS	39051
Alexander	James	15509 Joan D'Arc	Biloxi	MS	39532
Allday	Ms. Kathy	Rt. 1 Box 638E	Ovett	MS	39464
Anderson	Sydney	P.O. Box 1898	Hattiesburg	MS	39403
Anderson	Mr. John	Perry County Board of Supervisors	New Augusta	MS	39462
Anderson	Mr. Paul L.	40 Woody Clark Rd.	Petal	MS	39465
Anderson	John W.	111 Good Hope Church Road	Richton	MS	39476
Anglin	Elizabeth	210 Hillendale Drive	Hattiesburg	MS	39401
Austin	Ms. Virginia B.	143 Seal Ave.	Biloxi	MS	39530
Bachhuber	Dr. Greg	2614 E. 6th Street	Duluth	MN	55812
Baker	Larry	108 Bridlewood Drive	Brandon	MS	39042
Bankston	Ms. Kathy	130 Sycamore Lane	Jackson	MS	39212
Bankston	Mr. Dennis M.	21786 Saucier Fairly Rd.	Saucier	MS	39574
Bartlett	Mr. Jack L.	601 Cruise St.	Starkville	MS	39759
Barton	Mrs. Allen R.	19 Mockingbird Lane	Gulfport	MS	39507
Batson	Brax	610 Bond Street	Wiggins	MS	39577
Baucum	Lance	Route 4	Wiggins	MS	39577
Baum	Jonathan	22724 Ellis Hamilton Rd	Pascagoula	MS	39567
Beaird	Mrs. Marion E.	RR 1 Box 54	Pope	MS	38658
Beamshau	Mr. & Mrs. E.W.	99 Lake Est Dr.	Hattiesburg	MS	39402
Beaugez	Gary and Donna	504 Vancleave Avenue	Ocean Springs	MS	39564
Beaumont	Nollie H.	214 Ford Drive	Petal	MS	39465
Behan	John M.	Columbus Lumber Co Box 536	Brookhaven	MS	39601
Bell	Don	P.O. Box 455	Bruce	MS	38915
Bell	Louise R.	4103 Franklin Avenue	Gulfport	MS	39507
Biggerstaff	Ben I.	2806 Williamsburg Rd.	Hattiesburg	MS	39402
Bishop	Ms. Gail	P.O. Box 1522	Ocean Springs	MS	39564
Block	Paul	CSU, Dept. of Range Science	Ft. Collins	CO	80526
Bond	Mr. and Mrs. Tony	192 John Bond Rd.	Wiggins	MS	39577
Boone	Tom	Box 100	Gautier	MS	39553
Boone	Edna	5719 Fontaine Beach Drive	Ocean Springs	MS	39564
Bosarge	Mitch	11508 Three Rivers Rd.	Gulfport	MS	39503
Boudreaux	Fred	3192 Oak Grove Rd.	Hattiesburg	MS	39402
Boyll	Jamie	P.O. Box 10006	Jackson	MS	39216
Bradley, Jr.	Mr. John R.	107 Phillip Road	Oxford	MS	38655
Brannan	Rex J.	Rt. 3 Box 146	Purvis	MS	39475
Brewer	Ms. Sheri	Rt. 2, Box 178A	Raleigh	MS	39153
Brock	Tom	P.O. Box 1858	Hattiesburg	MS	39403
Brockman	Ott	P.O. Box 1191	Hattiesburg	MS	39401
Broome	Mr. Richard L.	1223 Canterbury Lake	Clinton	MS	39058
Brown	Ms. E. Lin	Rt. 1 - Box 121	Benton	MS	39039
Budraitis	Stan	16216 Big Ridge Rd	Biloxi	MS	39532
Burnam	John A.	P.O. Box 445	Hattiesburg	MS	39403

Distribution List For Summary of Final EIS

Burnham	Chester K.	4 Eastbrooke	Jackson	MS	39216
Burns	Mr. Ed	880 Lindh #219	Gulfport	MS	39507
Bustin	Ms. Rosa Kathlyn	140 W. 19th St.	Laurel	MS	39440
Byrd	Malcolm	109 Stevens Street	Petal	MS	39465
Callahan	Deborah	6541 Hwy 49	Hattiesburg	MS	39401
Canon	Jesse	106 Hewes Square Plaza	Gulfport	MS	39507
Carrigan	Charles and Paula	14642 Farlow Road	Gulfport	MS	39503
Carson	Mrs. Charles Clifton	Box 38, Lake Road	Conehatta	MS	39057
Carter	Charles	Box 823	New Albany	MS	38652
Cates	Ms. Arlene	1325 Glacier Avenue	Ocean Springs	MS	39564
Chunn	Mrs. Anson Bob	115 Spanish Moss Drive	Clinton	MS	39056
Claude	Mr. Wayne	2101 22 Ave.	Gulfport	MS	39501
Clearman	H.C.	P.O. Box 111	Petal	MS	39465
Cochran	Honorable Thad	SR-326 Russell Senate Office Bldg.	Washington	D.C.	20510
Cochran	Preston M.	2538 Hwy 29 S.	Brooklyn	MS	39425
Cochran	Mr. Burke V.	857 Benndale Road	Wiggins	MS	39577
Colie	Stuart	118 Wateredge Drive	Ocean Springs	MS	39564
Conner	Ms. Lucy K.	1378 Beach Blvd.	Biloxi	MS	39530
Cooley	Richard and Deborah	252 Bryant Road	Brooklyn	MS	39425
Cotten	Milam S.	210 6th Avenue	Hattiesburg	MS	39402
Cox	Ron	52 Cablebridge Road	Perkinston	MS	39573
Coyne	J.F.	9564 Evans Rd.	Gulfport	MS	39501
Craft	Mr. Stephen A.	1310 Queen Park Circle	Ocean Springs	MS	39564
Crosby	Cary	152 Oil Well Road	Wiggins	MS	39577
Curley	Mr. John	P.O.Box 1731	Hattiesburg	MS	39403
D'Aquilla	Mrs. Carolyn M.	41 Linda Lane	Long Beach	MS	39560
Dalrymple	Sandra	160 Pine Grove	Biloxi	MS	39531
Dana	Thomas F.	277 Hurricane Creek Road	Lumberton	MS	39455
Dana, Jr.	Caleb	360 Culley Drive	Jackson	MS	39206
Daniels	Hobart	P.O. Box 44	Richton	MS	39476
Daughtry	Larry Joe	101 Pinewood Dr	Hattiesburg	MS	39402
Davis	James T. and Dena L.	11601 Wilfred Oliver Road	Ocean Springs	MS	39564
Dent	Hayes	The Governor's Office Box 139	Jackson	MS	39205
Derr	Reid S.	305 S. 12th Avenue	Hattiesburg	MS	39401
Dickson-Rishel	Rod	13083 Nugent Road	Gulfport	MS	39503
Dix	A. Frank	13911 El Bonito W.	Ocean Springs	MS	39564
Donovan	Edward F.	P.O. Box 87	Biloxi	MS	39533
Dorris, District Mgr.	Percy C.	Box 1085	Tupelo	MS	38802
Dougherty	Joel and Lynne	1664 Beach Blvd. #51	Biloxi	MS	39531
Eastman	Mr. R. D.	305 Hillendale Drive	Hattiesburg	MS	39402
Engram	Robert and Carmen	20523 Mennonte Road	Gulfport	MS	39503
Eppling	Charles	1320 Main Street	Hattiesburg	MS	39401
Evans	Ms. Beverly E.	904 Homestead Blvd.	Gautier	MS	39553
Fairchild	Mark	119 Dogwood Drive	Hattiesburg	MS	39402
Fairley	James	P.O. Box 96	Petal	MS	39465
Farris	A.B.	Morton Mfg Co., Inc Drawer K	Morton	MS	39117
Ferrell	Bill	601 S. 19th Ave.	Hattiesburg	MS	39401
Ferrill	Austin N. and John	P. O. Box 151	Hattiesburg	MS	39403
Fields	Rod	9833 Pt. Aux Cherees Road	Ocean Springs	MS	39564
Fincher	Ms. Elizabeth	P.O. Drawer F	Pass Christian	MS	39571
Fisher	Dr. Gloria	Semko and Associates P.O. Box 13903	Jackson	MS	39236
Floyd	Jason and Evelyn	1421 24th Avenue	Gulfport	MS	39501
Ford	Jean	Highway 49 N.	Hattiesburg	MS	39401
Freeman	Jean	424 23rd Avenue	Hattiesburg	MS	39401
Fuller	Ms. Lena N.	1295 Father Ryan	Biloxi	MS	39530
Fulton	Ms. Rubye	5737 Clinton Blvd.	Jackson	MS	39209
Furman, Jr.	Ralph	9216 Hensarling Rd.	Petal	MS	39465
Galey	C.D	P. O.Drawer 791	Hattiesburg	MS	39403
Gandy, Jr.	Mrs J. M.	19 Marlin Circle	Hattiesburg	MS	39402
Gannon	C.	1344 Wooddell Dr.	Jackson	MS	39212
Gardner	Louise and Dan	190 Bluebird Lane	Brandon	MS	39042
Garrott	Anne	1807 Ray Street	Ocean Springs	MS	39564
Gibbs	Pat & Terry	1067 3rd Ave.	Laurel	MS	39440
Gillespie	Sarah	500 Walnut	Hattiesburg	MS	39401
Gillie	Nathan and Marie	2754 Hwy 29	Brooklyn	MS	39425
Gillie	Doris	233 St. John Road	Brooklyn	MS	39425
Gillie	Kim	228 St. John Road	Brooklyn	MS	39425
Gilpin	Michael	517 Eatonvile Rd.	Hattiesburg	MS	39403
Gorsey	John	502 Martin Avenue	Ocean Springs	MS	39564
Gosselink, Prof. Emeritus	James	LSU, Dept. of Ocean & Coastal Science	Baton Rouge	LA	70803
Graham	William	P.O. Drawer 750	Hattiesburg	MS	39401
Graves	Carolyn	P. O. Box 154	Moselle	MS	39459
Graves	Olivia and John	21568 Gartman Road	Saucier	MS	39574
Gray	John K.	506 Rebecca Ave.	Hattiesburg	MS	39401
Gunn	Annie	5025 Wayneland Drive	Jackson	MS	39211
Guthrie	John G.	P.O. Box 400	Wiggins	MS	39577
Hall	SFC Jeanette S.	1127 Eatonville Rd.	Hattiesburg	MS	39401
Hall	Robert	224 Mitchell Street	Ocean Springs	MS	39564
Hammack	Marcus	14900 Highway 22	Bolton	MS	39041
Harper	William & Martha	129 St. Charles	Biloxi	MS	39530
Hatten	Budge	Box 98	Wiggins	MS	39577
Havens	Peter	3505 Anderson Hill Road	Silverdale	WA	98383
Heath, Forester	Jim	101 Jami Street	Jackson	AL	36545
Heidelberg, Jr.	Mrs. R.W.	801 S. 18th Ave.	Hattiesburg	MS	39401
Hembree	Dan G.	807 Progress Road	McLain	MS	39456
Hensen	Dan	15031 Bethel Hill Road	Ocean Springs	MS	39564
Herrington	Terry	Box 1973	Hattiesburg	MS	39403
Hicks	Mr. G.S.	8 Dogwood Hill Drive	Jackson	MS	39211
Hill	Merrianne	5261 Clair Street	Jackson	MS	39206
Hilliard, Director	Elbert	MS Dept of Arch. & Hist. Box 571	Jackson	MS	39205
Hilton	Jean	9406 Janice Brooklyn Rd.	Brooklyn	MS	39425
Hinkle	Sharon	41 40th Street	Gulfport	MS	39507
Hirsch	Peter J. and Joan	13128 Hanover Drive	Ocean Springs	MS	39564
Holladay	Robert Lawson	P.O. Box 288	Drew	MS	38737
Hoper	Robert	1210 35th Street	Gulfport	MS	39501
Houston	Joe	Route 2 Box 179	Raleigh	MS	39153
Howell	William S.	P.O. Box 667	Purvis	MS	39475
Hudson	Robert V.	483 Elks Lakes Rd.	Hattiesburg	MS	39401
Huffman	Alan	1056 Old Bridgeport Road	Bolton	MS	39041
Hughes	Jess	P.O. Box 763	Hattiesburg	MS	39403
Hughes, Jr.	Dan C.	P. O. Box 5628	Brandon	MS	39047

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Humphrey	Henry S.	15805 Allie Byrd Road	Ocean Springs	MS	39564
Hyde	Rosemary	322 Owen Drive	Grenada	MS	38901
Jarrell	Robert	328 Emerson Drive	Hattiesburg	MS	39401
Johnson	Robert L.	189 Arnett Road	Hattiesburg	MS	39401
Johnson	Lawrence E.	608 Concart Street	Hattiesburg	MS	39401
Johnson	Charles	P. O. Box 16358	Hattiesburg	MS	39404
Johnson	Don	14 Williamsburg Dr.	Petal	MS	39465
Johnson	Exton R.	15324 Royal St.	Gulfport	MS	39503
Johnson	Robert	23230 Saucier-Lizana Road	Saucier	MS	39574
Jones	Roger	P. O. Box 1028	Jackson	MS	39215
Jordan, Chief	Freddie	301 Bldg, Suite 300	Jackson	MS	39201
Kallam	Stewart	77 Lee Cemetery Road	Tylertown	MS	39667
Keenan	C. T. and Jeannette	1203-E Old Pass Road	Long Beach	MS	39560
Keith	Susan	519 Greensboro Street	Starkville	MS	39759
Keppner	Dr. Edwin	3500 Delwood Beach Road	Panama City	FL	32407
King	Honorable Tom	P. O. Box 1134	Petal	MS	39465
Kochtitzky	Penny	273 Ralph Rawls Rd.	Hattiesburg	MS	39402
Koopman	Frank and Florence	108 Ramoneda Street	Bay St. Louis	MS	39520
Kornman	Pam	3076 Highland Avenue	D'Iberville	MS	39532
Kulick	Patricia	13713 Windlo Circle	Ocean Springs	MS	39564
Kutack, Business Manager	Jason	P. O. Box 16357	Hattiesburg	MS	39404
Laird	Carrie	245 E. Capitol Street, Rm.226	Jackson	MS	39201
Langenwalter	W. D.	52 - 54th Street	Gulfport	MS	39507
Lantz	Allen D.	104 St. Augustine Dr.	Long Beach	MS	39560
Lebow	Jeanne	P. O. Box 290	Gautier	MS	39553
Lee	Justin	590 Leeville Road	Petal	MS	39465
Lee	Robert E.	2039 North Drive	Biloxi	MS	39531
Lewis	J. Tipton	P.O. Box 627	Jackson	MS	39205
Lewis	Leighton	P.O. Box 1231	Hattiesburg	MS	39403
Lindsley, Jr.	William R.	6142 Old Hwy 42	Hattiesburg	MS	39402
Loper	Gary	2613 Bullis Avenue	Gulfport	MS	39501
Lott	Honorable Trent	SR-487 Russell Senate Office Bldg.	Washington	D.C.	20510
Love	Louise	306 Grand Avenue	Yazoo City	MS	39194
Lowrie	Allen	230 FZ Goss Road	Picayune	MS	39466
Luck, III	Leon E.	213 Dewey Ave.	Ocean Springs	MS	39564
Mabry	John	Mabry Lumber Company	Liberty	MS	39645
Mahaffey	Faye	Rt 3, Box 30, Mullican Rd	Florence	MS	39073
Maslowski	Mrs. Edward	30-51 Street	Gulfport	MS	39507
Mason	Robert D. and Betty	P.O. Box 61	Brooklyn	MS	39425
Masters	David and Carolyn	76 Shady Lane	Hattiesburg	MS	39402
Mauffray, Jr.	Owen L.	22 Magnolia Trace	Hattiesburg	MS	39402
Maxim, Jr.	Mrs. G.F.	13 Maxim Dr.	New Augusta	MS	39462
McArthur	N.	1000 Beverly Hills Rd.	Hattiesburg	MS	39401
McArthur	Johnny	P.O. Box 5	Hattiesburg	MS	39403
McClendon	Arvah	5107 Quincy Avenue	Gulfport	MS	39507
McConnell, SE Rep	Chester A.	110 Wildwoods Lane	Lawrenceburg	TN	38464
McDaniel	Ms. Sandra	1451 Rebel Drive	Jackson	MS	39211
McDaniel	Mrs. Pat	2308 Middlecoff Drive	Gulfport	MS	39507
McDannald	B. Randolph	209 Tantallon Drive	Ocean Springs	MS	39564
McGinnis	Helen	103 Magnolia Street	Edwards	MS	39066
McGinnis	L. A. and Lucy	2303 McInnis Street	Hattiesburg	MS	39402
McGuire	J.D.	30 52nd Street	Gulfport	MS	39507
McIlwain	Tom	P.O. Box 7000	Ocean Springs	MS	39564
McIntosh	Mark F.	910 Fairview Street	Jackson	MS	39202
McKell, Jr.	William M.	4105 Hospital St., #111	Pascagoula	MS	39581
McLeod	Sara	621 Eagle Avenue	Jackson	MS	39206
McPherson	Randall	Rt. 2 Box 1266	Starkville	MS	39759
McSwain, Sr.	Robert J.	P.O. Box 401	New Augusta	MS	39462
Miller	David	1908 Swallow Lane	Tupelo	MS	38801
Miller, Professor	W. Frank	P.O. Box 9681	Mississippi State	MS	39762
Mitchell, Chief-Coastal Prog.	Jerry	2620 Beach Boulevard	Biloxi	MS	39531
Mixon, Jr.	Mrs. G.F.	13 Mixon Drive	New Augusta	MS	39462
Montgomery	Honorable G.V.	2184 Rayburn House Office Building	Washington	D.C.	20515
Moon	Michael	1002 Terminal Drive	Moselle	MS	39459
Morrison	Claire	4 Boggsdale	Long Beach	MS	39560
Murdock	Michael	Rt. 2 Box 249	Moselle	MS	39459
Musgrave	Anna	Rt. 1., Box 824	Hattiesburg	MS	39401
Myers	Robert T.	P.O. Box 1464	Hattiesburg	MS	39403
Myers	Donnie F.	373 Sheeplo Loop	Petal	MS	39465
Napier	Wenda G.	404 South Main Street	Petal	MS	39465
Napier	J.E. and Reba	P. O. Box 135	Petal	MS	39465
Napier	R.M.	Rt. 2 Box 50	Seminary	MS	39479
Nye	Eric	73711 Diamondhead Dr. N.	Diamondhead	MS	39523
Odom	Mrs. Doug	839 Arlington Street	Jackson	MS	39202
Odom	Michele & Terry	129 Fillingame Road	Hattiesburg	MS	39401
Odom	Stewart	810 31st Avenue	Hattiesburg	MS	39401
Oglesbee	Debra	180 John Bond Road	Wiggins	MS	39577
Owens	J.R.	201 Pecan Grove Dr.	Hattiesburg	MS	39402
Pace	Louis and Shirley	116 Lamar Avenue	Hattiesburg	MS	39402
Page	Mary	133 Caribbean Cove	Clinton	MS	39056
Parker	Honorable Mike	1410 Longworth House Office Building	Washington	D.C.	20515
Parker	Freeman	106 Wildwood Trace	Hattiesburg	MS	39402
Patterson	Tammy	27 Brewer Rd.	Purvis	MS	39475
Patterson, Jr.	Vernon R.	P. O. Box 704	Beaumont	MS	39423
Paulson	Oscar	1550 2nd Street #57	Pass Christian	MS	39571
Pearce	Lois Anne	330 Lakebend Drive	Brandon	MS	39042
Pearce	Mrs. Eula B.	32 Paret Tower Road	Brooklyn	MS	39425
Pearce	Gordon E. and Violet	62 Paret Tower Rd.	Brooklyn	MS	39425
Pearson	Doris	150 W. Main Street	Florence	MS	39073
Perrot	Mrs T.W.	P. O. Box 16894	Hattiesburg	MS	39404
Phalen	Tim	615 S. 19th Ave.	Hattiesburg	MS	39401
Pickering	John D.	11 Clinic Road	Hattiesburg	MS	39402
Pickering	Larry	572 Big Four Road	Wiggins	MS	39577
Pillow	Hart	110 Sis Circle	Hattiesburg	MS	39402
Polk	Frank	PO Box 1150	Hattiesburg	MS	39401
Pool	Joann W.	121 Woodglen Drive	Gulfport	MS	39507
Potvin	Leo	683 Lynn Ray Road	Petal	MS	39465
Price	Thomas and Jeanette	410 Weathersby Road	Hattiesburg	MS	39402
Puckett	Jim	P. O. Box 16863	Hattiesburg	MS	39404
Purvis	Dale	P.O. Box 4079	Gulfport	MS	39502
Raley	Charles	P. O. Box 298	Gautier	MS	39553

Distribution List For Summary of Final EIS

Rawlings, MD	Franklin	1155 Ocean Springs Road	Ocean Springs	MS	39564
Rawls	C.E.	11438 Coleman Rd.	Gulfport	MS	39503
Rawls	Don	4110 Washington Avenue	Gulfport	MS	39507
Ray	William K.	Box 16509	Hattiesburg	MS	39403
Recore	Lauril	327 Barkwood Circle	Biloxi	MS	39532
Reese	Elizabeth S	406 Jeff Davis Avenue	Waveland	MS	39576
Reid, Dist. Engineer	William	P.O. Box 1509	Hattiesburg	MS	39403
Rhodes	Margaret	P. O. Box 178	Ackerman,	MS	39735
Rich	Troy W.	13611 Three Rivers Road	Gulfport	MS	39503
Richard	Bryan J.	14535 Big John Road	Biloxi	MS	39532
Richter	Susan T.	4839 Sheridan Dr.	Jackson	MS	39206
Ricks	William K & Camelia B	6512 Shore Drive	Ocean Springs	MS	39564
Robiller	J.E.H.	402 Fleitas Avenue	Pass Christian	MS	39571
Robinson	A.A.	P.O. Box 16507	Jackson	MS	39236
Rowe	Sarah	111 N 33rd Ave., #E-11	Hattiesburg	MS	39401
Shaffer	Dorothy	317 Westview Drive	Biloxi	MS	39531
Shank	Brett	20553 Hilltop Rd	Saucier	MS	39574
Sharp	James and Jane P.	903 Farnsworth Avenue	Pascagoula	MS	39567
Shelby	Les	126 Fannin Landing Road	Brandon	MS	39042
Shepard	Steve	P.O. Box 514	Gautier	MS	39553
Simmons	Frances	6518 U.S. Hwy 49	Hattiesburg	MS	39401
Simonton	J.B.	230 Briar Hill Cove	Florence	MS	39073
Simpson	Willie and Joe	8 Fathom Circle	Hattiesburg	MS	39402
Sisk	Larry W.	17 Ruth Ezell Rd.	Hattiesburg	MS	39401
Skupien, Comm. Coordinator	Linda C.	P. O. Box 7000	Ocean Springs	MS	39566
Slade	Susan	P.O. Box 143	Purvis	MS	39475
Slater	E.L. and Margaret	9210 Scenic River Drive	Biloxi	MS	39532
Sledge	T. Mark	P. O. Box 1021	Jackson	MS	39215
Smee	Nola	15708 Little Joe Road	Biloxi	MS	39532
Smith	Mrs Frances Price	401 S. 21st Ave	Hattiesburg	MS	39401
Smith	Quilla	Route 6, Box 1499	Hattiesburg	MS	39401
Smith	Benita	1610 Glenn Swetman	Biloxi	MS	39530
Smith	Bob	Post Office Box 117	Biloxi	MS	39533
Sneed	Robert W.	P. O. Box 2251	Jackson	MS	39225
Snell	Lydia	2618 Demaret Drive	Gulfport	MS	39507
Spann	C. W.	545 16th Street Apt. #36	Gulfport	MS	39507
Speed	Charles	341 Ralph Rawls Rd.	Hattiesburg	MS	39402
Spell	Joe	1905 Ridgeway	Hattiesburg	MS	39401
Spinks	Joe	Louisiana-Pacific	Philadelphia	MS	39350
Stachling	M. David	P. O. Box 508	Biloxi	MS	39533
Steed	Allen T.	588 Leeville Rd.	Petal	MS	39465
Stevens	W. Kenneth	P.O. Box 151	Hattiesburg	MS	39403
Stocker	Lisa	International Paper Company P.O. Box 412	Canton	MS	39046
Stocker, Chairperson	Lisa	P.O. Box 412	Canton	MS	39046
Stone	Richard	1216 Marie St.	Hattiesburg	MS	39402
Streuly	Charles D.	2605 Demaret Drive	Gulfport	MS	39507
Sullivan	Mr. Garland W.	209 N. 22nd Ave.	Hattiesburg	MS	39401
Tatum	Joe F. and J. F.	2600 Mimosa Ln	Hattiesburg	MS	39401
Tatum, Jr.	Frank	112 Mandalay Dr.	Hattiesburg	MS	39402
Tatum, Jr.	John M.	P.O. Box 1649	Hattiesburg	MS	39403
Taylor	Honorable Gene	215 Cannon House Office Building	Washington	D.C.	20515
Taylor	Patricia	11099 Woolmarket Lk. Rd.	Biloxi	MS	39532
Temple, Proc Mgr.	F. Lee	Rt 1, Box 17	Duck Hill	MS	38925
Thomas	Mark W.	728 Berkshire Dr.	Hattiesburg	MS	39402
Thompson	Honorable Bennie G.	1408 Longworth House Office Building	Washington	D.C.	20515
Thompson	Henry E.	2314 N. 5th Ave.	Laurel	MS	39440
Tims	James	P. O. Box 2111	Laurel	MS	39440
Tisack	Sam and Elaine	799 Mars Hill Road	Wiggins	MS	39577
Todd	Sally	2228 Wild Valley	Jackson	MS	39211
Touchstone	Gene	148 Ace Carlisle Rd.	Richton	MS	39476
Travgott, Chair, MS SAF	Tim	1241 Mound Street	Grenada	MS	38901
Troyka	Robbie and Jeff	37 Ferwood Dr.	Laurel	MS	39440
Tuepken	Jo	#3 Boggs Drive	Long Beach	MS	39560
Tynes	Inez	R.R. 1 Box 151	Magee	MS	39111
Valerine	Mrs. V.H.	19447 Shorecrest Road	Biloxi	MS	39532
Van Zandt	Woodie	18227 Smith Road	Gulfport	MS	39503
Van Zandt	Edward	6194 W. Wittman Road	Pass Christian	MS	39571
Vance	Colonel Hilton R.	5912 Kristen Drive	Jackson	MS	39211
Varnado	David	315 West Street South	McComb	MS	39648
Varnado, Jr.	T. D.	2004 East Pass Road	Gulfport	MS	39507
Venus, Jr.	Rev. Charles C.	900 Dabbs Street	Hattiesburg	MS	39401
von Seutter	Virginia	P. O. Box 104	Magee	MS	39111
Waldorf	David and Elizabeth	2611 Parkview Drive	Biloxi	MS	39531
Walker	Mr. Roger G.	P.O. Box 571	Jackson	MS	39205
Walker	Emmett	1055 Newland St.	Jackson	MS	39211
Walley	Paul G. and Marie	Route 4 Box 105AA	Richton	MS	39476
Walters	Gary	2054 Hwy 29	Brooklyn	MS	39425
Walters	Gene	#1 Ponderosa Dr.	Petal	MS	39465
Watson	Dr. Ray	Dept of Biol. Science Drawer GY	Mississippi State	MS	39762
Weems	Stephen L.	Rt. 2 Box 14BB	Lake	MS	39092
Weldy	Larry and Debbie	800 Carterville Road	Petal	MS	39465
Wells, Jr.	W.E.	GA-Pacific Corp, Ste 104B 1080 River Oaks	Jackson	MS	39208
Whatley	David B.	165 Whatley Road	Brooklyn	MS	39425
White	Patricia	Route 2, Box 387	Heidelberg	MS	39439
White	Edith	124 Clower Ave	Long Beach	MS	39560
White	C. Thomas	2313 Ellis Merchant Road	Pascagoula	MS	39567
Whitten	Honorable Jamie L.	2314 Rayburn House Office Building	Washington	D.C.	20515
Wilkinson	Rodney and Karen M.	11553 Harris Drive	Gulfport	MS	39503
Williams	Donald F.	9383 Janice Brooklyn Rd.	Brooklyn	MS	39425
Williams	Cecil	1105 Park Drive	Laurel	MS	39440
Williamson	G.D.	1216 Elks Lake Rd.	Hattiesburg	MS	39401
Williamson	David and Brenda	P. O. Box 614	Hattiesburg	MS	39403
Winn	Cecil L.	107 Chesterfield	Hattiesburg	MS	39402
Wolfe	Douglas and Elizabeth	18 Acorn Place	Hattiesburg	MS	39402
Wood, Jr., Chair	Forrest	SS, Box 5015	Hattiesburg	MS	39406
Woodall	Donald	P. O. Box 15853	Hattiesburg	MS	39402
Woodbridge, Jr.	Dr and Mrs H.B	327 Briarwood Drive	Jackson	MS	39206
Wray	Lamar	Rt. 1 Box 13	Kilmichael	MS	39747
Young	Paul and Celeste	112 Elias Whiddon Rd.	Hattiesburg	MS	39401
Zander	Carlton	27440 Wolf Creek Road	Perkinston	MS	39573

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Military Training Use of National Forest Lands: Camp Shelby, Mississippi

Chapter 8

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CHAPTER 8.0 INDEX

The following entries were selected to represent topics which were believed to be either of general interest, technical interest, or were mentioned during the scoping process and the review of the Draft EIS. Those technical or jargon terms marked with an asterisk (*) are defined in the Glossary, which follows the Table of Contents.

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Environmental Impact Statement

Military Training Use of National Forest Lands: Camp Shelby, Mississippi

Chapter 9

COORDINATION

CHAPTER 9.0 COORDINATION

The Draft EIS on Military Training Use of National Forest Lands, Camp Shelby, Mississippi was prepared in 1990-1991. It was filed with the Environmental Protection Agency and mailed to 681 agencies, organizations, and individuals on November 21, 1991. The notice for the Draft EIS was published in the *Federal Register* at that time. The public comment period given in that letter was from November 29, 1991 to January 28, 1992. At the request of several persons, the public comment period was extended to March 1, 1992. All comments were responded to regardless of date of receipt.

Three public meetings were held on the Draft EIS (at Jackson, Gulfport, and Hattiesburg, Mississippi) in January 1992. They were attended by a total of more than 300 persons. The questions or concerns of people attending the meetings were collected on comment sheets given out during the meeting. A court stenographer was available to record statements for people who preferred dictating their comments. Written statements prepared prior to the meetings were also accepted at that time. During the public comment period, comments on the Draft EIS were received from 321 agencies, interested organizations, and individuals. In all, more than 2,200 comments, questions, issues, or concerns were identified. Volume III of the Final EIS contains the responses to comments received on the Draft EIS.

The following persons, agencies and groups were on the Draft EIS distribution list:

Distribution List for Draft EIS

Garden Clubs of Mississippi	100 24th Street	Gulfport	MS	39530
Mississippi Archeological Association	115 Wiltshire Boulevard	Biloxi	MS	39531
Biloxi Chamber of Commerce	P.O. Box CC	Biloxi	MS	39530
Aaron, Grace		Biloxi	MS	39533
Adkins, Danny		Lucedale	MS	39452
Agregaard Jr. Sgt., Edwin A.		D'Iberville	MS	39532
Ainsworth, Dennisea		Sandersville	MS	39477
Alcorn State University,	Department of Forestry	Lorman	MS	39096
Alfaro, Ricardo		Gulfport	MS	39503
Alfaro, Victor		Gulfport	MS	39503
Alldrege, Emily		Long Beach	MS	39560
Allen, Donna		Ocean Springs	MS	39564
Allen, Jr. Mrs. Cleve		Gulfport	MS	39501
Allin, Judith A.		Biloxi	MS	39532
Almquist, Bryon		New Orleans	LA	70119
Anderson, John W.		Richton	MS	39476
Anderson, Mark		Hattiesburg	MS	39401
Anderson-Tully Co.	1242 N Second St	Memphis	TN	38103
Anglin, Elizabeth		Hattiesburg	MS	39401
Aultman, Tim		Petal	MS	39465
Austin, Karen		Hattiesburg	MS	39401
Auter, Don		Petal	MS	39465
Autry, Lanny L.	Mid-South Forestry, Inc Box 823	New Albany	MS	38652
Backe, Paul		Bay St. Louis	MS	39520
Backstrom, O		Gulfport	MS	39507
Bagley, Fred A.	U.S. Fish and Wildlife Service 300 Woodrow Wilson, Suite 3185	Jackson	MS	39213
Bailey, James Andrew	Weyerhauser Co. Box 577	Bruce	MS	38915
Baker, Larry		Brandon	MS	39042
Baldwin, Jack L.		Hattiesburg	MS	39401

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Barefield, Stone		Forrest	MS	39074
Barneycastle, Chris		Forrest Park	GA	30051
Barr, Dexter		Hattiesburg	MS	39401
Batson, Brax		Wiggins	MS	39503
Batte and Sons, Jack		Forest	MS	39074
Baucum, Lance		Wiggins	MS	39577
Bean, Jr. The Honorable James L.		Hattiesburg	MS	39401
Beasley, Maybelle		Jackson	MS	39206
Beason, Kim		University	MS	38677
Beaugez, Donna		Ocean Springs	MS	39564
Beaugez, Gary		Ocean Springs	MS	39564
Becker, Carolyn		Hattiesburg	MS	39401
Behan, John M.	Columbus Lumber Co Box 536	Brookhaven	MS	39601
Bell, Don		Bruce	MS	38915
Bell, Louise R.		Gulfport	MS	39507
Ben, Patrick		Brooklyn	MS	39425
Bentley, Glaydette		Gulfport	MS	39501
Bethea, Jack		Gulfport	MS	39564
Bevill, Vernon	MS Department of Wildlife, Fisheries and Parks P.O. Box 451	Jackson	MS	39205
Bills, Cleveland		Hattiesburg	MS	39401
Black Creek Canoe Rental	P. O. Box 414	Brooklyn	MS	39425
Blair, Joyce		Wiggins	MS	39577
Blair, Stanley		Wiggins	MS	39577
Blalock, Lee		Perkinston	MS	39573
Blount, Darrell		Hattiesburg	MS	39401
Boatwell, A.D.		Soso	MS	39480
Bond, Edward		Perkinston	MS	39573
Boone, Tom		Gautier	MS	39563
Boone, Edna		Ocean Springs	MS	39564
Bosarge, Robert		Moss Point	MS	39563
Boudreaux, Fred		Hattiesburg	MS	39402
Bounds, Hal		Hattiesburg	MS	39401
Bowen, Richard		Hattiesburg	MS	39406
Bowling, Dale R.		Laurel	MS	39440
Bowling, Dale		Laurel	MS	39440
Boyd, Randy P.	Westvaco Corp Box 933	Tupelo	MS	38802
Boyd, Gary Price	Union Camp Corp Box 87	Baxley	GA	31513
Bradley, Beth and Dan		Gulfport	MS	39503
Bradshaw, Dwight		Waveland	MS	39529
Branche, PE, Charles T.	Dept. of Agriculture & Commerce P. O. Box 1609	Jackson	MS	39205
Braswell, Janet		Hattiesburg	MS	39401
Breland, Jackey		Beaumont	MS	39423
Breland, Hubert and Maragite		Hattiesburg	MS	39401
Brenke, Jr. Charles		Vancleave	MS	39564
Brent, Dr. Charles	USM Institute of Env. Science 206 Velma Street	Hattiesburg	MS	39401
Brewer, Franklin		Wiggins	MS	39577
Brewer, Jason and Earl		Moss Point	MS	39563
Broach, Walter L.		Pass Christian	MS	39571
Broome, Teresa		Hattiesburg	MS	39401
Brown, Johnny		Purvis	MS	39475
Brown, Wilford		Hattiesburg	MS	39402
Bryant, James		Brooklyn	MS	39425
Buckley, John		Hattiesburg	MS	39401
Bullard, Steven		Starkville	MS	39762
Bumgardner, Dr.	USM Dept of Human Performance & Recreation South Station 1542	Hattiesburg	MS	39406

Distribution List for Draft EIS

Burchell, Dr.	USM Dept. of Human Performance & Recreation South Station 1542	Hattiesburg	MS	39406
Bureau of Pollution Control	Director, MS Dept. of Environmental Quality P.O. Box 10385	Jackson	MS	39209
Bureau of Recreation and Parks	Director, MS Dept of Natural Resources P.O. Box 10600	Jackson	MS	39209
Burke, Shelia		Biloxi	MS	39530
Burril, Mrs. C. F.		Pass Christian	MS	39571
Buskirk, Ron	Gulf Coast Group Sierra Club 2115 Boardman Blvd.	Gulfport	MS	39507
Butler, Steve M.	Deposit Guaranty Natl Bank Box 1200	Jackson	MS	39205
Byrd, Malcolm		Petal	MS	39465
Caillavet, Bayne		New Augusta	MS	39462
Cain, Wayne		Hattiesburg	MS	39401
Cake, Dr. Ed		Gulfport	MS	39503
Cake, Dr. Edwin W.	Gulf Coast Regional Consv. Com. P. O. Box 176	Ocean Springs	MS	39564
Callahan, Deborah		Hattiesburg	MS	39401
Campbell, Ellen G.		Clinton	MS	39056
Canon, Jesse		Gulfport	MS	39507
Carley, Mike		Hattiesburg	MS	39401
Carlton, Neely		Hattiesburg	MS	39406
Carnahan, Darlene		Beaumont	MS	39423
Carpenter, Ben, Preston and Beau		Wiggins	MS	39577
Carr, John R.	Ratson Wood Products, Inc. P.O. Box 236	Valley Park	MS	39177
Carrigan, Paula		Gulfport	MS	39503
Carrigan, Charles		Gulfport	MS	39503
Carter, Dolphus (Buster)		Ocean Springs	MS	39564
Carter, Kent		Hattiesburg	MS	39401
Carter, Andrew		Hattiesburg	MS	39401
Chandler, John		Biloxi	MS	39531
Clark, Kyle		Gulfport	MS	39507
Clark, Charles		Ocean Springs	MS	39564
Cleveland, Dr. Joan		Bay St. Louis	MS	39520
Clinkscales, William H.	Delta Conservation League P.O. Box 180	Delta City	MS	39061
Clinton, Phillip		Hattiesburg	MS	39401
Clinton, Debbie		Hattiesburg	MS	39401
Coachys, Rich		Hattiesburg	MS	39402
Coast Audubon Society	c/o Uevin Howe 9532 Red Bluff	Ocean Springs	MS	39564
Coast Guard Headquarters	400 7th Street, S.W.	Washington	DC	20591
Coccaro, John	Cooperative Extension Service	Rolling Fork	MS	39159
Cochran, The Honorable Thad	U.S. Senate	Washington	DC	20510
Cochran, Luther		Petal	MS	39465
Cole, The Honorable Dorthy G.		Picayune	MS	39466
Colie, Stuart		Ocean Springs	MS	39564
Collins, Bill		Biloxi	MS	39532
Collins, Leonard		Gulfport	MS	39507
Collins, Terese		Biloxi	MS	39530
Collins, Mark		Hattiesburg	MS	39401
Combs, Ken		Gulfport	MS	39502
Commander, 8th Coast Guard District	Hale Boggs Federal Bldg. 500 Camp Street	New Orleans	LA	70130
Conway Pole and Piling Co.	P.O. Box 162	New Augusta	MS	39462
Cook, Ronnie		D'Iberville	MS	39532
Cooley, Richard and Deborah		Brooklyn	MS	39425
Coordinator, Federal-State-Local Programs	Office of the Governor 1304 Sillers Bldg	Jackson	MS	39201

Copeskey, Jeff		Jackson	MS	39202
Corbitt, Steve	MS Forestry Association, Inc. 620 N State St, Suite 201	Jackson	MS	39202
Coryard, Mr. & Mrs. J. F.		Gulfport	MS	39503
Cotten, Milam S.		Hattiesburg	MS	39402
Covington, Nell		Enterprise	MS	39330
Cowan, Vincent		Hattiesburg	MS	39401
Crawford, Ted		Hattiesburg	MS	39401
Creech, Lloyd and Mary		Gulfport	MS	39501
Crosby, Cary		Long Beach	MS	39560
Crowege, Chris		Long Beach	MS	39560
Crump, Dwayne		Jackson	MS	39202
Crumpler, Harry		Petal	MS	39465
Dale, Fred		Ocean Springs	MS	39504
Dale, M.A.		Pascagoula	MS	39402
Dana, Thomas F.		Lumberton	MS	39455
Daniels, Robert		Hattiesburg	MS	39402
Darling, O H	Georgia-Pacific Corp Box 520	Crossett	AR	71625
Darras, Thomas and Linda		Hattiesburg	MS	39402
Dauro, David		Long Beach	MS	39560
Davis, Mrs. Iddo L.		Brookhaven	MS	39601
Davis, Clyde	Jackson Audubon Society 4626 Hazelwood Drive	Jackson	MS	39211
Davis, Thomas		Laurel	MS	39440
Davis, Manes T.		Ocean Springs	MS	39654
Davis, Edward		Soso	MS	39480
Davis, Dena L.		Ocean Springs	MS	39564
Davis, Bruce		Wiggins	MS	39577
Dawkins, M. S.		Ocean Springs	MS	39564
Delk, Charles and Rosemary		Gulfport	MS	39507
Denehie, Doug		Ocean Springs	MS	39564
Dennis, Walter B.	South Central Region, I.P. Co. Box 999	Natchez	MS	39120
Denton, Walter		Brooklyn	MS	39425
Denton, Dr. Virgina		Brooklyn	MS	39425
Denton, Denny		Brooklyn	MS	39425
Denton, Lucy		Hattiesburg	MS	39401
Dilalla, Dr. Vincenzio		Gulfport	MS	39507
Director, NOAA	Ecology & Environment Conservation Office, Room 6222 14th & Constitution Ave. N.W.	Washington	DC	20230
Director, Bureau of Geology	MS Dept of Environmental Quality P.O. Box 5348	Jackson	MS	39216
Director, Executive, MS State Port Authority at Gulfport	P.O. Box 40	Gulfport	MS	39502
Director, Executive, MS Dept of Environmental Quality	P.O. Box 20305	Jackson	MS	39201
District Engineer	Federal Highway Administration Dept. of Transportation 666 North Street, Suite 105	Jackson	MS	39202
Divic, M. Vic		Jackson	MS	39211
Dodds, Ross		Hattiesburg	MS	39401
Doolittle, Mr. and Mrs. H. L.		Gulfport	MS	39501
Dorris, Percy C.	Westvaco Corp Box 1085	Tupelo	MS	38802
Dorris, Percy		Tupelo	MS	38802
Doty, John D.	Monticello Hardwood, Inc Box 1069	Monitcello	MS	39654
Droddy, Dodie		Pass Christian	MS	39571
DRTR, OFF/ENV Project Review	Office of the Secretary Dept. of the Interior Rm. 4536	Washington	DC	20240
Durrwachter, Sonja		Wiggins	MS	39577
Dye, Gene		Petal	MS	39465

Distribution List for Draft EIS

Dykes, Willis		Petal	MS	39465
Ebner, Sharon		Biloxi	MS	39535
Edhe, Jr., Martin	William Carey College 1856 Beach Dr.	Gulfport	MS	39507
Elam, William	School of Forest Resources MSU, Drawer FR	Mississippi State	MS	39762
Ellard, Dr.	USM Dept. of Human Performance & Recreation South Station 1542	Hattiesburg	MS	39406
Elmore, James		Brandon	MS	39042
Engram, Robert		Gulfport	MS	39503
Environment and Standards Office	Assist Reg Administrator for CPD Dept of HUD, Region IV Richard B. Russell Federal Bldg. 75 Spring Street, S.W.	Atlanta	GA	30303
Environmental Compliance	Southeast Regional Office Heritage Conservation and Recreation Service 75 Spring Street	Atlanta	GA	30303
Environmental Compliance	Southeast Regional Office National Park Service Richard B. Russell Federal Bldg 75 Spring Street	Atlanta	GA	30303
Environmental Protection Agency	Mail Code A-104 Room 2119 401 M Street SW	Washington	DC	20460
Eppling, Charles		Hattiesburg	MS	39401
Eshee, Jr., William D.		Starkville	MS	39759
Espy, The Honorable Mike	House of Representatives	Washington	DC	20515
Estes, Larry		Jackson	MS	39206
Evans, Mrs. H.T.		Laguna Beach	FL	32407
Executive Director	Advisory Council on Historic Preservation 1522 K Street, N.W.	Washington	DC	20005
Faeser, Richard S.		Biloxi	MS	39532
Fairchild, Mark		Hattiesburg	MS	39402
Fairley, James		Petal	MS	39465
Farlon, Harold		New Augusta	MS	39462
Farris, A.B.	Morton Mfg Co., Inc Drawer K	Morton	MS	39117
Farris, Scott		Hattiesburg	MS	39401
Fatardo, Louis		Hattiesburg	MS	39401
Fayard, Mike		Biloxi	MS	39532
Federal Aviation Administration, Director	ATTN: Chief, Planning & Appropriations Staff P.O. Box 20636	Atlanta	GA	30320
Fields, Rod		Ocean Springs	MS	39564
Fillingane, Dan		Brooklyn	MS	39425
Fokakis, John		Hattiesburg	MS	39401
Ford, Jean		Hattiesburg	MS	39401
Forman, Eddie		Gloster	MS	39638
Fowler, Doss		Hattiesburg	MS	39401
Freeman, Jean		Hattiesburg	MS	39401
Friesema, H. Paul	Center for Urban Affairs & Policy Research 2040 Sheridan Road	Evanston	IL	60201
Gaddis, Debbie	% International Paper Co PO Box 412	Canton	MS	39046
Garner, John H.		New Augusta	MS	39462
Gartin, Bill	The Governor's Office Box 139	Jackson	MS	39205
Gates, Terrie		Purvis	MS	39475
Gautier, Warren		Pascagoula	MS	39567
Georgia Pacific/Rex Timber Co	P. O. Box 555	Taylorsville	MS	39168
Geraci, John		Purvis	MS	39475

Distribution List for Draft EIS

Gibbs, Pat & Terry		Laurel	MS	39440
Gibson, Charles		Petal	MS	39465
Giliberti, Joseph		Hattiesburg	MS	39401
Gill, Deputy Director, Mr. Joe	Bureau of Marine Resources Dept of Wildlife, Fisheries & Parks 2620 Beach Boulevard	Biloxi	MS	39531
Gillespie, Sara		Hattiesburg	MS	39401
Gillialand, William		Jackson	MS	39296
Gillie, Kim		Brooklyn	MS	39425
Gillie, Marie		Brooklyn	MS	39425
Gillie, Doris		Brooklyn	MS	39425
Gillie, Nathan		Brooklyn	MS	39425
Gillie, Neil		Hattiesburg	MS	39401
Gillie, Louis		Hattiesburg	MS	39401
Gillie, Doris		Brooklyn	MS	39425
Gillie, Sr. , Louis L.		Brooklyn	MS	39425
Gilpin, Michael		Hattiesburg	MS	39401
Gordon, Mrs. Hylma		Hattiesburg	MS	39402
Gordon, Ken,	MS Natural Heritage Program 111 N. Jefferson St.	Jackson	MS	39201
Gordon, Hylma		Hattiesburg	MS	39401
Gorsey, John		Ocean Springs	MS	39564
Graham, Randy		Laurel	MS	39440
Graham, William		Hattiesburg	MS	39401
Graves, Olivia		Saucier	MS	39574
Grayson, Edna		Hattiesburg	MS	39402
Green, Charles		Jackson	MS	39201
Green, John		Hattiesburg	MS	39401
Groce, Ronald E.		Gulfport	MS	39501
Guess, Alan		Biloxi	MS	39532
Guice, Reed		Biloxi	MS	39535
Guice, John		Hattiesburg	MS	39402
Gulf Lumber Co	Box 1663	Mobile	AL	36633
Guyton, Earnie		Hattiesburg	MS	39401
Hadwell, Ronnie		Biloxi	MS	39532
Hall, Larry		Hattiesburg	MS	39402
Hamilton, Cynthia		Pascagoula	MS	39567
Hamilton, Wallace		Petal	MS	39465
Hamon, Bill		Purvis	MS	39475
Hankins, David L	Hankins Lumber Co, P.O. Box H	Grenada	MS	38901
Hardin, James		Biloxi	MS	39532
Hariel, Ron		Perkinston	MS	39573
Harmer, R. G.		Pass Christian	MS	39571
Harper, William & Martha		Biloxi	MS	39530
Harvill, DC		Waveland	MS	39576
Harwell, J. E.		Ocean Springs	MS	39564
Harwell, Robert		Biloxi	MS	39533
Harwell, Jr. Ronnie		Biloxi	MS	39532
Hasten, Lora		Ocean Springs	MS	39564
Hasten, John C.		Ocean Springs	MS	39654
Hastert, Jr. Jesse M.		Gulfport	MS	39501
Havens, Peter	Engineering Field Activity Northwest CODE 09EP 3505 Anderson Hill Road	Silverdale	WA	98383
Heath, Jim		Jackson	AL	36545
Hensen, Dan		Ocean Springs	MS	39564
Henwood, Dr. Terry	Protected Species Branch NMFS Duval Bldg 9450 Koger Boulevard	St. Petersburg	FL	33702
Herbert, Mrs. J. C.		Shaw	MS	38773
Heriot, Dr. Jean		Hattiesburg	MS	39401
Herndon, Ernest	% Enterprise Journal Box 910	McComb	MS	39638

Distribution List for Draft EIS

Herring, Jack	Division of Wildlife & Fisheries P.O. Box 451	Jackson	MS	39205
Hicks, Bob		Gulfport	MS	39502
Hill, Edward	HQ FORSCOM FCEN-RDE Building 704	Ft. Gillem	GA	30050
Hill, Sara		Hattiesburg	MS	39401
Hill, Jr. Edgar Y.		Summit	MS	39666
Hilliard, Elbert	MS Dept of Archives & History Box 571	Jackson	MS	39205
Hinkle, Sharon		Gulfport	MS	39507
Hirsch, Peter and Joan		Ocean Springs	MS	39564
Hirsch, Peter J.		Ocean Springs	MS	39564
Holladay, Robert Lawson		Drew	MS	38737
Honnold, Douglas L.	Sierra Club Legal Defense Fund 1631 Glenarm Place, Suite 300	Denver	CO	80202
Hoper, Robert		Gulfport	MS	39501
Hopstien, Rick		Hattiesburg	MS	39401
Horhn, John	Tourism and Development Div P O Box 849	Jackson	MS	39205
Houtz, G. W.		Gulfport	MS	39566
Howell, T.L. and Chris		Hattiesburg	MS	39402
Howse, Dr. Harold D.	Director, Gulf Coast Research Lab P.O. Box AG	Ocean Springs	MS	39564
Hudson, Tom	Sierra Club 1602 Linden Place	Jackson	MS	39202
Hughes, Jess		Hattiesburg	MS	39401
Hutto, C. W., Elsie, and A.C.		Gulfport	MS	39501
Jackson State University	School of Science & Technology	Jackson	MS	39217
James, Curtis	U.S. Fish and Wildlife Service 900 Clay Street, Room 235	Vicksburg	MS	39180
Jarrell, Robert P.		Hattiesburg	MS	39401
Jarrell, Joey		Hattiesburg	MS	39401
Jarrell, Robert		Hattiesburg	MS	39401
John, Morgan		Hattiesburg	MS	39401
Johnson, Robert		Saucier	MS	39574
Johnson, Bob		Hattiesburg	MS	39402
Johnson, Charles		Hattiesburg	MS	39402
Johnson, Billy Ray		Biloxi	MS	39532
Johnson, Candance		D'Iberville	MS	39532
Johnston, Earnestine		Beaumont	MS	39423
Jones, Neal		Biloxi	MS	39531
Jones, Roger	% Nature Conservancy MS Office P. O. Box 1028	Jackson	MS	39215
Jones, Willis		Petal	MS	39465
Jones, The Honorable William H.		Petal	MS	39465
Jones, Dr. James I.	MS-AL Sea Grant Consortium Caylor Building Gulf Coast Research Laboratory	Ocean Springs	MS	39564
Jordan, Ronald		Biloxi	MS	39531
Jordan, Freddie		Jackson	MS	39201
Jordan, William		Purvis	MS	39475
Jordan, Jr., Pringle		Moss Point	MS	39563
Joyner, Tommy W.	Georgia-Pacific Corp Box 555	Taylorsville	MS	39168
Keenan, Jeannette		Long Beach	MS	39560
Keenan, C. T.		Long Beach	MS	39560
Keene, Mike		Forrest	MS	39074
Kemmerer, NOAA, Dr. Andrew	National Marine Fisheries Service SE Regional Office, Region 2 Duval Bldg., 9450 Koger Blvd	St. Petersburg	FL	33702
Keppner, Dr. Edwin	National Marine Fisheries Service Environmental Assessment Branch 3500 Delwood Beach Road	Panama City	FL	32407

Kerr, Carol		Waveland	MS	39576
Kimbrough, Dan		Pearl	MS	39208
King, Dr. John	Division of Parks and Recreation P.O. Box 451	Jackson	MS	39205
King, Barry		Gulfport	MS	39503
Kornman, Pam		D'Iberville	MS	39532
Kornman, Connie		D'Iberville	MS	39532
Kulick, Bill		D'Iberville	MS	39532
Kulick, Patricia		Ocean Springs	MS	39564
Lacey, Mrs. Thomas C.	The Garden Clubs of MS, Inc.	Holly Springs	MS	38635
Lack, John		Jackson	MS	39208
Ladner, Vincent		Gulfport	MS	39503
Lagarde, Chris	c/o The Honorable Gene Taylor 1225 Jackson Avenue	Pascagoula	MS	39567
Laird, Carrie	245 E. Capitol Street Room 226	Jackson	MS	39201
Lamb, Edwin		Brooklyn	MS	39425
Lambert, The Honorable Paul Richard		Hattiesburg	MS	39401
Landrum, Dwaine		Pascagoula	MS	39567
Landrum, W.		Petal	MS	39465
Langston, Jr. Carlos		Jackson	MS	39401
Lawson, Danny		Gulfport	MS	39503
Lee, Billy		Hattiesburg	MS	39401
Lee, Bill		Wiggins	MS	39577
LeFan, Buster	Two Wheel Drive Hunting Club 136 Northwest Circle	Hattiesburg	MS	39401
Leger, Gratia		Gulfport	MS	39506
Leopold, Dr Bruce	Dept of Wildlife & Fisheries P. O. Drawer LW	Mississippi State	MS	39762
Letchworth, Charles		Hattiesburg	MS	39401
Leubecker, Mr. Daniel	Code 840, Room 7328 Maritime Administration Department of Transportation 400 7th Street, S.W.	Washington	DC	20590
Lewis, J. Tipton		Jackson	MS	39205
Lewis, Leighton		Hattiesburg	MS	39404
Libbey, Don	U.S. Bureau of Land Management 300 Woodrow Wilson, Suite 326	Jackson	MS	39213
Lilly, Donna		Ellisville	MS	39437
Lloyd, Susan		Rolling Fork	MS	39159
Long, Karen		Pass Christian	MS	39571
Loper, Gary		Gulfport	MS	39501
Loper, Kerry		Gulfport	MS	39501
Lorch, William		Hattiesburg	MS	39401
Lott, The Honorable Trent	U.S. Senate	Washington	DC	20510
Lott, Alfred		New Augusta	MS	39462
Lott, Margaret		Hattiesburg	MS	39401
Low, David		Hattiesburg	MS	39401
Lowery, Houston		Gulfport	MS	39503
Lowery, Tom	Forrest County Agricultural High School P. O. Box 9	Brooklyn	MS	39425
Lowery, Esther		Hattiesburg	MS	39401
Lundin, Emily		Hattiesburg	MS	39401
Lutz, Gregory		Gulfport	MS	39503
Mabry, Robert B.		Ocean Springs	MS	39564
Mabry, James		Purvis	MS	39475
Mabry, John	Mabry Lumber Company	Liberty	MS	39645
Mabus, Governor Ray	Office of the Governor P.O. Box 139	Jackson	MS	39215
Mallett, Sidney L.		Saucier	MS	39574
Mallette, Cathy	Office of Policy Development 421 W Pascagoula St.	Jackson	MS	39203

Malone, Jorita		Sumrall	MS	39482
Malone, Sidney		Hattiesburg	MS	39401
Malone, Jim		Sumrall	MS	39482
Marodis, Steve		Hattiesburg	MS	39401
Martin, Nancy		Ocean Springs	MS	39564
Martin, Fred		Hattiesburg	MS	39401
Martin, B.J.		Hattiesburg	MS	39401
Maskew, Jr., James		Gulfport	MS	39507
Massengale, Ed		Hattiesburg	MS	39401
Masters, David		Hattiesburg	MS	39402
Mathews, Ricky R.		Biloxi	MS	39535
Mauffray, Owen and Kitty		Gulfport	MS	39503
Mayeu, Martha P.		Gulfport	MS	39501
McCardle, Wayne		Hattiesburg	MS	39401
McClendon, A. C.		Gulfport	MS	39501
McClendon, Arvah		Gulfport	MS	39507
McClendon, Arvah Carlyce		Gulfport	MS	39501
McConnell, Floyd		Gulfport	MS	39501
McConnell, Chester A.	Wildlife Management Institute Rt. 6, Box 212	Lawrenceburg	TN	38464
McCoy, John M.		Gulfport	MS	39506
McDaniel, James		Gulfport	MS	39501
McDaniel, S. E.		Hattiesburg	MS	39401
McDaniel, Dr. Sidney	Inst. Botanical Explorations Box EN	Mississippi State	MS	39762
McDonald, Lynn		Hattiesburg	MS	39401
McGhee, Robert		Gulfport	MS	39507
McGhee, William G.		Gulfport	MS	39501
McGinnis, Lucy		Hattiesburg	MS	39402
McGinnis, Helen		Edwards	MS	39066
McGrath, Dr. Greg		Biloxi	MS	39531
McGraw-Curran Lumber Co	Box 450	Yazoo City	MS	39194
McGuire, J.D.		Gulfport	MS	39507
McIlwain, Tom		Ocean Springs	MS	39564
McKay, Thomas E.		Gulfport	MS	39507
McRee, E.H.		New Augusta	MS	39462
Mestaver, Vera		Waveland	MS	39576
Metzerott, J. H.		Gulfport	MS	39507
Meyer, Mr. Edward	Federal Maritime Commission Office of Energy and Environmental Impact 1100 L Street, N.W.	Washington	DC	20573
Milfort, Cindy		Biloxi	MS	39530
Milfort, Roger		Biloxi	MS	39530
Miller, Louie and Deborah		Canton	MS	39046
Miller, W. Frank	MS State University Drawer FR	Mississippi State	MS	39762
Miller, Gerald	U.S. EPA, EIS Review 343 Courtland Ave., NE	Atlanta	GA	30308
Millet, Lisa		Hattiesburg	MS	39406
Mills, The Honorable Cecil E.		Clara	MS	39324
Mitchell, Cameron		Gulfport	MS	39501
Molpus, Honorable James E.	Agriculture Comm. MS Senate Box 176	Clarksdale,	MS	38612
Monaghan, Dr. Thomas A.	MS Coop Extension Service P.O. Box 5426	Mississippi State	MS	39762
Montague, Frank		Hattiesburg	MS	39401
Montgomery, The Honorable G.V.	House of Representatives	Washington	DC	20515
Moon, Michael		Moselle	MS	39459
Moore, David		Jackson	MS	39206
Moore, Richard		Ocean Springs	MS	39564
Moore, John O.	Conservation Forester Rt 4, Box 224	Waynesboro	MS	39367
Moorman, Charles and Barbara		Hattiesburg	MS	39402

Distribution List for Draft EIS

Morgan, Anette	245 E. Capitol Street Suite 222	Jackson	MS	39201
Morgan, Jerry & Stephanie		Hattiesburg	MS	39401
Morgan, John		Brandon	MS	39042
Morris, Ken		Hattiesburg	MS	39401
Mosher, Robert		Petal	MS	39465
Moss, Robert S.	Mississippi Forestry Commission Suite 300, 301 Building 301 N. Lamar Street	Jackson	MS	39201
MS Gulf Coast Community College	Perkinston Campus	Perkinston	MS	39573
MS Lumber Manufactureers Assoc	Box 5241	Jackson	MS	39216
MS Manufacturers Assn	720 N President St.	Jackson	MS	39201
MS Valley State University	Department of Forest Resources	Itta Bena	MS	38941
Mucha, Ronald		Gulfport	MS	39503
Mulford, Johnny		Hattiesburg	MS	39401
Murphy, Ken		Bay St. Louis	MS	39520
Myers, David W.		Moss Point	MS	39563
New, James		Hattiesburg	MS	39401
Newsome, Thomas W.		Gulfport	MS	39503
Nicholson, L.		Hattiesburg	MS	39401
Nobles, Paula G.		Ellisville	MS	39437
Nugent, John	International Paper Company Box 999	Natchez	MS	39120
O'Keefe, Jim		Biloxi	MS	39532
Odom, Terry		Hattiesburg	MS	39401
Odom, Steward		Hattiesburg	MS	39401
Office of Environmental Project Review	Department of the Interior Room 4241 18th & C Streets, N.W.	Washington	DC	20240
Owen, Carlton	MS Wildlife Federation Box 1814	Jackson	MS	39201
Pace, Louis		Hattiesburg	MS	39402
Palmer, Henry		Purvis	MS	39425
Parker, The Honorable Mike	House of Representatives	Washington	DC	20515
Parker, The Honorable Carl		Sumrall	MS	39402
Parsons, George	MS Dept. of Planning & Policy 1304 Walter Sillers Bldg.	Jackson	MS	39202
Pascale, Tony		Hattiesburg	MS	39401
Pat Harrison Waterway District	Highway 49, South Drawer 1509	Hattiesburg	MS	39401
Patterson, Tammy		Purvis	MS	39475
Patton, Gordon S.		New Orleans	LA	70115
Patton, Jr. Wendell		Perkinston	MS	39573
Paulsen, John		Gulfport	MS	39503
Paulson, Oscar		Pass Christian	MS	39571
Payne, Robert L.		Ocean Springs	MS	39564
Pearce, Violet		Brooklyn	MS	39425
Pearce, Ray D.		Biloxi	MS	39532
Peeler, Jr. Dudley F.	Jackson Audubon Society 4645 E. Cheryl Drive	Jackson	MS	39211
Perkins, Jerry	Leaf River Forest Products PO Box 329	New Augusta	MS	39462
Perrett, Jr. J. N.		Gulfport	MS	39507
Perttula, Timothy K.		Arvada	CO	80002
Pickering, Larry		Wiggins	MS	39577
Pierce, Jr. Kenneth		Petal	MS	39465
Pittman, Ronnie		Hattiesburg	MS	39401
Pitts, Thomas		Long Beach	MS	39560
Pledger, Timothy		Petal	MS	39465
Polk, Frank		Hattiesburg	MS	39401
Poole, Richard		Madison	MS	39110
Potvin, Leo		Petal	MS	39465
Powell, Joel		New Augusta	MS	39462
Powell, Dane		Long Beach	MS	39560
Price, Thomas and Jeanette		Hattiesburg	MS	39402

Prince, Ed and Fay		Brooklyn	MS	39425
Prine, Eldred Lynn	Southern Resource Service, Inc. Drawer 1246	Starkville	MS	39759
Puchette, Jim		Hattiesburg	MS	39402
Puckett, James		Hattiesburg	MS	39402
Quesenbery, Tom		Gulfport	MS	39503
Quesenlsey, Thomas		Gulfport	MS	39507
Quinn, Buffy		Hattiesburg	MS	39401
Randolph, Dr. & Mrs. James		Long Beach	MS	39560
Ratcliff, J. Ted		Brookhaven	MS	39601
Rawls, Don		Gulfport	MS	39501
Rawson, Ivey		Gulfport	MS	39503
Readman, Sam		Gulfport	MS	39507
Reaves, Edith		Long Beach	MS	39560
Reaves, James and Edith		Long Beach	MS	39560
Reese Berry, Robin		Gulfport	MS	39501
Reeves, Walter		Petal	MS	39564
Region III Director	Federal Railroad Administration 440 N. Tower 3400 Whipple Street	East Point	GA	30309
Region IV Secretarial Representative	U.S. Department of Transportation Suite 515 1720 Peachtree Road	Atlanta	GA	30309
Regional Director	Federal Emergency Management Administration Region IV 1375 Peachtree Street, N.E.	Atlanta	GA	30309
Reid, Margaret	P.O. Box 1030 Pine Belt Mental Health Center	Hattiesburg	MS	39401
Rice, Joey		Ocean Springs	MS	39564
Richards, Dr. Douglas P.	Dept. of Forestry Drawer FR	Mississippi State	MS	39762
Riddle, Barbara		Hattiesburg	MS	39401
Riser, Ellis		Hattiesburg	MS	39401
Risk, Nick		Hattiesburg	MS	39401
Risk, Ann		Hattiesburg	MS	39401
Robbins, Brenda		Gulfport	MS	39501
Robertson, W.V.		Pass Christian	MS	39571
Robinson, Robby		Hattiesburg	MS	39401
Rod Dickson-Rishel		Gulfport	MS	39503
Rogers, Vickie		Hattiesburg	MS	39401
Rogers, Buddy		Hattiesburg	MS	39401
Rogers, Sadie		Columbia	MS	39429
Rogers, Charles		Columbia	MS	39429
Rose, Tim		Wiggins	MS	39577
Rosso, Sam		Hattiesburg	MS	39401
Rush, Linda		Biloxi	MS	39535
Samson, Julie		Hattiesburg	MS	39401
Sanders, Mary		Gulfport	MS	39503
Sanders, Michael		Hattiesburg	MS	39402
Santucci, Pat		Gulfport	MS	39401
Savelle, Jr. Ike Winston	MCES/MAFES Box 730	Leakesville	MS	39451
Schoolar, Bob		Jackson	MS	39206
Schroeder, Brund D.		Ocean Springs	MS	39564
Schroeder, Linda		Ocean Springs	MS	39564
Schwabacher, Bahiyyih Sunshine		Bay St. Louis	MS	39520
Scianna, Debbie		Bay St. Louis	MS	39520
Scotch Lumber Co., Inc.	Box 616	Fulton	AL	36446
Scott, Susan		Hattiesburg	MS	39401
Seal, James W.		Ocean Springs	MS	39564
Sellers, Walter and Melonie		Wiggins	MS	39577
Sellers, Clyde		Richton	MS	39476
Sellers, Ben		Hattiesburg	MS	39401

Distribution List for Draft EIS

Seyffert, Mr. John	Federal Emergency Management Administration, Room 713 500 C Street, S.W.	Washington	DC	20573
Shaffer, Dorothy		Biloxi	MS	39531
Sharp, Jane P.		Pascagoula	MS	39567
Sharp, James		Pascagoula	MS	39567
Shattles, Ramona		Hattiesburg	MS	39401
Shaw, Lynn		Hattiesburg	MS	39401
Sheely, Brian		Gulfport	MS	39507
Shelby, Les		Brandon	MS	39042
Sherman, Ross		Wiggins	MS	39577
Shoulders, Gene		Pineville	LA	71360
Shows, Ernie		Hattiesburg	MS	39401
Shows, Ernie and Tammy		Hattiesburg	MS	39401
Sierra Club, MS Chapter	Box 4335 Fondren Station	Jackson	MS	39216
Simm, Patricia		Pass Christian	MS	39571
Simphins, Harry		Gulfport	MS	39506
Simpson, Willie and Joe		Hattiesburg	MS	39402
Sims, Lamar		Beaumont	MS	39423
Slade, Susan		Purvis	MS	39475
Smee, Nola		Biloxi	MS	39532
Smistik, Robert		Wiggins	MS	39577
Smith, James		Brooklyn	MS	39425
Smith, Jerry		Long Beach	MS	39560
Smith, Vincent		Gulfport	MS	39503
Smith, Kenneth		Hattiesburg	MS	39401
Smith, Suzanne		Bay St. Louis	MS	39520
Smith, Bob		Biloxi	MS	39533
Smith, Floycille		Brooklyn	MS	39425
Smith, Kenneth		Fernwood	MS	39635
Smith, Quilla		Hattiesburg	MS	39401
Smith, James		Brooklyn	MS	39425
Smith, John Allen	The Nature Conservancy P O Box 630	Meadville	MS	39653
Smith, Lee		Hattiesburg	MS	39401
Smith, Charles		Leaf	MS	39450
Snodgrass, Stanley		Hattiesburg	MS	39401
Soil Conservation Service, U.S.	Suite 1321 Federal Building 100 West Capitol Street	Jackson	MS	39201
Spann, C. W.		Gulfport	MS	39507
Special Programs	Dept Health and Human Services Center for Environmental Health Shamblee 27 Centers for Disease Control	Atlanta	GA	30333
Spell, Joe		Hattiesburg	MS	39401
Spinks, Joe	Louisiana-Pacific	Philadelphia	MS	39350
Staehling, Joseph		Ocean Springs	MS	39564
Stafford, Tom		Hattiesburg	MS	39401
Starks, Eugene		Hattiesburg	MS	39401
State of MS Clearinghouse for Fed. Programs	455 N. Lamar Street	Jackson	MS	39202
Stepko, George		Hattiesburg	MS	39401
Stern, Mr. Robert	Division of NEPA Affairs Department of Energy Room 4G064 1000 Independence Avenue, S.W.	Washington	DC	20585
Stocker, Lisa	MS Society of American Foresters P.O. Box 16357	Hattiesburg	MS	39402
Stocker, Lisa	International Paper Company P.O. Box 412	Canton	MS	39046
Ston, Joe		Hattiesburg	MS	39401
Stone Co. Economic Dev. Foundation	P. O. Box 569	Wiggins	MS	39577
Stoop, William		Hattiesburg	MS	39401
Stout, Kathy		Hattiesburg	MS	39402

Distribution List for Draft EIS

Stover, Curtis		Jackson	MS	39216
Straka, Thomas James	MS State University Drawer FR	Mississippi State	MS	39759
Strickland, Freddie Ray	Leaf River Forest Products Box 329	New Augusta	MS	39462
Sullivan, Lee		Hattiesburg	MS	39401
Swindill, Linda		Jackson	MS	39204
Talley, Eleanor M.	Natchez Audubon Society 2082 Eleanor Street	Vidalia	LA	71373
Tapp, Edward		Biloxi	MS	39532
Tatum, Joe		Hattiesburg	MS	39401
Taylor, The Honorable Gene	House of Representatives	Washington	DC	20515
Taylor, Jerry B.		Hattiesburg	MS	39402
Taylor, Metro		Wiggins	MS	39577
Taylor, Lee		Petal	MS	39465
Temple, F. Lee	Georgia-Pacific Corp Rt 1, Box 17	Duck Hill	MS	38925
Thomas, Charlie		Shuqualak	MS	39361
Thomason, Bill		Hattiesburg	MS	39401
Thompson, Warren S.	School of Forest Resources Drawer FR	Mississippi State	MS	39762
Thoms, Richard H.	Richton Tie & Timber Co Box 64	Newton	MS	39345
Thornhill, Kyle		Hattiesburg	MS	39401
Thrash, Edwin G.		Saucier	MS	39574
Tidwell, Mr. Greer	Environmental Protection Agency 345 Courtland Street N.E.	Atlanta	GA	30365
TN River Pulp & Paper Company	PO Box 89 4800 Brookwood Place	Pontotoc	MS	38863
Toliver, John	Southern Hardwoods Lab P O Box 227	Stoneville	MS	38751
Tomasovsky, Gerald		Brandon	MS	39042
Touchstone, Charles		Gulfport	MS	39505
Trahan, Michele		Hattiesburg	MS	39402
Turner, Sue		Lucedale	MS	39452
Turner, J. Michael		Ridgeland	MS	39157
U.S. Public Health Service	Food and Drug Administration P.O. Box 158	Dauphin Island	AL	36528
Uher, Mark		Hattiesburg	MS	39401
Van Aller, Robert		Hattiesburg	MS	39401
Van Zandt, Edward		Pass Christian	MS	39571
Van Zandt, Woodie		Long Beach	MS	39560
Vance, Hilton R.		Jackson	MS	39211
VanSlyke, Jr. The Honorable J. B.		Hattiesburg	MS	39401
Varnado, Jr. T. D.		Gulfport	MS	39507
Vaughn, Jim J.		Long Beach	MS	39560
Verucchi, Charlie	Weyerhaeuser Co Box 577	Bruce	MS	38915
Verzwyvelt, Liz		Long Beach	MS	39560
Vincent, Mr. & Mrs. David		Gulfport	MS	39507
Vu, Loan		Biloxi	MS	39533
Waite, Cile Freeman		Hattiesburg	MS	39401
Waldorf, Elizabeth Dr.		Biloxi	MS	39531
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Walters, Gene F.	Southern Lumber Co. Inc. Box 608	Crosby	MS	39633

Ward, James		Pass Christian	MS	39571
Ward, Suzann		Hattiesburg	MS	39401
Warren, B. Jack	Forest Farmers Assn. Box 95385	Atlanta	GA	30347
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Wilkinson, Rodney		Gulfport	MS	39503
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Zdenek, Jimmy		Ocean Springs	MS	39564
Zimmerman, Mr. Carl	National Park Service Gulf Islands National Seashore 1801 Gulf Breeze Parkway	Gulf Breeze	FL	32561

Address Confirmation/Document Preference Mailer

In May 1994, a postage paid mailer was sent to the 1,060 addresses on the Camp Shelby mailing list. The purpose of this mailer twofold: 1) to verify the accuracy of the addresses on the mailing list, and 2) to allow the addressees to indicate their preference for receipt of a Summary of the Final EIS, receipt of the entire 2,400 page Final EIS, or to have their name removed from the mailing list. Approximately 12% of the original addressees were not considered deliverable by the U.S. Postal Service. Of the remaining 88%, about two-thirds wished to receive only the summary, and about one-fourth wished to receive the full three-volume EIS. The remainder requested to be dropped from our mailing list.

The circulation of a Summary of the Final EIS is permitted according to 40 CFR 1500.4(h) and 1502.19(d), in an effort to reduce paperwork and expense. These federal regulations also require that full copies of the Final EIS be sent to appropriate agencies and members of the public who provided substantive comments on the Draft EIS. Copies of the Final EIS have been provided to numerous Mississippi public libraries, including those in Jackson, Hattiesburg, Pascagoula, Gulfport, Biloxi, Bay St. Louis, Wiggins, Beaumont, McLain, New Augusta, and Laurel, as well as college libraries at University of Southern Mississippi (Hattiesburg), Mississippi State University (Starkville), and University of Mississippi (Oxford). The complete mailing list of libraries to which full copies of the three-volume EIS was sent follows:

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	The Library	(Hattiesburg, Petal, Forrest County) 723 Main Street	Hattiesburg	MS	39401
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	University of Southern Mississippi	Cook Library P. O. Box 5053	Hattiesburg	MS	39406
	Beaumont Public Library		Beaumont	MS	39423
	Lauren - Jones Library Association	530 Commerce Street	Laurel	MS	39440
	Stone County Library	242 Second Street	Wiggins	MS	39447
	McLain Public Library	River Avenue	McLain	MS	39456
	New Augusta Public Library		New Augusta	MS	39462
	Pearl River Community College	Library Station A, P. O. Box 5060	Poplarville	MS	39470
	Gulfport-Harrison County Library	P. O. Box 4018	Gulfport	MS	39502
	Hancock County Library System	312 Highway 90	Bay St. Louis	MS	39520
	Biloxi Public Library	139 Lameuse Street	Biloxi	MS	39530
	MS Gulf Coast Community College	Library P. O. Box 47	Perkinston	MS	39573
	Mississippi State University	Mitchell Memorial Library P. O. Box 5408	Mississippi State	MS	39762
Jackson-George Library	Regional Library System,	3214 Pascagoula Street	Pascagoula	MS	39567
	Jones County Junior College		Ellisville	MS	39437
Library	MS Gulf Coast Comm. College	Jefferson Davis Campus	Gulfport	MS	39501
Library	MS Gulf Coast Comm. College	Jackson County Campus	Gautier	MS	39553

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Director, NOAA	Ecology & Environment Conservation 14th & Constitution Ave. NW, Rm 6222	Washington	D.C.	20230
Office of Env Pol & Compl (MIB-2340)	U.S. Dept. of the Interior 1849 C Street, N.W.	Washington	D.C.	20240
U.S. Army Corps of Engineers	CECW-PO 20 Massachusetts Ave., NW	Washington	D.C.	20314
Advis. on Env. Qual., Env. Compl. Branch	Federal Energy Regulatory Commission 825 N. Capital St., NE, Rm. 7312	Washington	D.C.	20406
Environmental Protection Agency	Mail Code A-104, Rm 2119 401 M Street SW	Washington	DC	20460
Director, Off. of Envir. Compliance	U.S. Dept. of Energy, Mail Code EH-22 1000 Independence Av, SW, Rm 3G092	Washington	D.C.	20585
Coast Guard Headquarters	U.S. Dept. of Transportation 400 7th Street, S.W.	Washington	D.C.	20591
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Federal Emergency Management Agency	1375 Peachtree Street, NE	Atlanta	GA	30309
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Environmental Coordination, P&B	USDA-Forest Service, R8 1720 Peachtree Rd., NW	Atlanta	GA	30367
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Jackson - Hinds Library	300 N State Street	Jackson	MS	39201
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Information Service Library	3825 Ridgewood Road	Jackson	MS	39211
Jackson State University	H.T. Sampson Library	Jackson	MS	39217
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Billy Beal, Library	Meridian Community College 910 Hwy 19 N.	Meridian	MS	39307
William Carey College	Library Tuscan Avenue	Hattiesburg	MS	39401
The Library	(Hattiesburg, Petal, Forrest County) 723 Main Street	Hattiesburg	MS	39401
University of Southern Mississippi	Cook Library P. O. Box 5053	Hattiesburg	MS	39406
Beaumont Public Library		Beaumont	MS	39423
Lauren - Jones Library Association	530 Commerce Street	Laurel	MS	39440
Stone County Library	242 Second Street	Wiggins	MS	39447
McLain Public Library	River Avenue	McLain	MS	39456
New Augusta Public Library		New Augusta	MS	39462
Pearl River Community College	Library Station A, P. O. Box 5060	Poplarville	MS	39470
Gulfport-Harrison County Library	P. O. Box 4018	Gulfport	MS	39502
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Jackson-George	Regional Library System,	3214 Pascagoula Street	Pascagoula	MS	39567
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Johnson, Forest Sup.	Mr. Kenneth R.	100 W. Capitol St., Suite 1141	Jackson	MS	39269
Kaskey	Joe	1316 14th Street	Plano	TX	75074
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Lechner, Jr.	Phil	387 Belvedere Cr.	Biloxi	MS	39531
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Baucum	Lance	Route 4	Wiggins	MS	39577
Baum	Jonathan	22724 Ellis Hamilton Rd	Pascagoula	MS	39567
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Behan	John M.	Columbus Lumber Co Box 536	Brookhaven	MS	39601
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Bell	Louise R.	4103 Franklin Avenue	Gulfport	MS	39507
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Bishop	Ms. Gail	P.O. Box 1522	Ocean Springs	MS	39564
Block	Paul	CSU, Dept. of Range Science	Ft. Collins	CO	80526
Bond	Mr. and Mrs. Tony	192 John Bond Rd.	Wiggins	MS	39577
Boone	Tom	Box 100	Gautier	MS	39553
Boone	Edna	5719 Fontaine Beach Drive	Ocean Springs	MS	39564
Bosarge	Mitch	11508 Three Rivers Rd.	Gulfport	MS	39503
Boudreaux	Fred	3192 Oak Grove Rd.	Hattiesburg	MS	39402
Boyll	Jamie	P.O. Box 10006	Jackson	MS	39216
Bradley, Jr.	Mr. John R.	107 Phillip Road	Oxford	MS	38655
Brannan	Rex J.	Rt. 3 Box 146	Purvis	MS	39475
Brewer	Ms. Sheri	Rt. 2, Box 178A	Raleigh	MS	39153
Brock	Tom	P.O. Box 1858	Hattiesburg	MS	39403
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Byrd	Malcolm	109 Stevens Street	Petal	MS	39465
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Canon	Jesse	106 Hewes Square Plaza	Gulfport	MS	39507
Carrigan	Charles and Paula	14642 Farlow Road	Gulfport	MS	39503
Carson	Mrs. Charles Clifton	Box 38, Lake Road	Conehatta	MS	39057
Carter	Charles	Box 823	New Albany	MS	38652
Cates	Ms. Arlene	1325 Glacier Avenue	Ocean Springs	MS	39564
Chunn	Mrs. Anson Bob	115 Spanish Moss Drive	Clinton	MS	39056
Claude	Mr. Wayne	2101 22 Ave.	Gulfport	MS	39501
Clearman	H.C.	P.O. Box 111	Petal	MS	39465
Cochran	Honorable Thad	SR-326 Russell Senate Office Bldg.	Washington	D.C.	20510
Cochran	Preston M.	2538 Hwy 29 S.	Brooklyn	MS	39425
Cochran	Mr. Burke V.	857 Benndale Road	Wiggins	MS	39577
Colie	Stuart	118 Wateredge Drive	Ocean Springs	MS	39564
Conner	Ms. Lucy K.	1378 Beach Blvd.	Biloxi	MS	39530
Cooley	Richard and Deborah	252 Bryant Road	Brooklyn	MS	39425
Cotten	Milam S.	210 6th Avenue	Hattiesburg	MS	39402
Cox	Ron	52 Cablebridge Road	Perkinston	MS	39573
Coyne	J.F.	9564 Evans Rd.	Gulfport	MS	39501
Craft	Mr. Stephen A.	1310 Queen Park Circle	Ocean Springs	MS	39564
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Curley	Mr. John	P.O.Box 1731	Hattiesburg	MS	39403
D'Aquilla	Mrs. Carolyn M.	41 Linda Lane	Long Beach	MS	39560
Dalrymple	Sandra	160 Pine Grove	Biloxi	MS	39531
Dana	Thomas F.	277 Hurricane Creek Road	Lumberton	MS	39455
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Daniels	Hobart	P.O. Box 44	Richton	MS	39476
Daughtry	Larry Joe	101 Pinewood Dr	Hattiesburg	MS	39402
Davis	James T. and Dena L.	11601 Wilfred Oliver Road	Ocean Springs	MS	39564
Dent	Hayes	The Governor's Office Box 139	Jackson	MS	39205
Derr	Reid S.	305 S. 12th Avenue	Hattiesburg	MS	39401
Dickson-Rishel	Rod	13083 Nugent Road	Gulfport	MS	39503
Dix	A. Frank	13911 El Bonito W.	Ocean Springs	MS	39564
Donovan	Edward F.	P.O. Box 87	Biloxi	MS	39533
Dorris, District Mgr.	Percy C.	Box 1085	Tupelo	MS	38802
Dougherty	Joel and Lynne	1664 Beach Blvd. #51	Biloxi	MS	39531
Eastman	Mr. R. D.	305 Hillendale Drive	Hattiesburg	MS	39402
Engram	Robert and Carmen	20523 Mennonte Road	Gulfport	MS	39503
Eppling	Charles	1320 Main Street	Hattiesburg	MS	39401
Evans	Ms. Beverly E.	904 Homestead Blvd.	Gautier	MS	39553
Fairchild	Mark	119 Dogwood Drive	Hattiesburg	MS	39402
Fairley	James	P.O. Box 96	Petal	MS	39465
Farris	A.B.	Morton Mfg Co., Inc Drawer K	Morton	MS	39117
Ferrell	Bill	601 S. 19th Ave.	Hattiesburg	MS	39401
Ferrill	Austin N. and John	P. O. Box 151	Hattiesburg	MS	39403
Fields	Rod	9833 Pt. Aux Cherees Road	Ocean Springs	MS	39564
Fincher	Ms. Elizabeth	P.O. Drawer F	Pass Christian	MS	39571
Fisher	Dr. Gloria	Semko and Associates P.O. Box 13903	Jackson	MS	39236
Floyd	Jason and Evelyn	1421 24th Avenue	Gulfport	MS	39501
Ford	Jean	Highway 49 N.	Hattiesburg	MS	39401
Freeman	Jean	424 23rd Avenue	Hattiesburg	MS	39401
Fuller	Ms. Lena N.	1295 Father Ryan	Biloxi	MS	39530
Fulton	Ms. Rubye	5737 Clinton Blvd.	Jackson	MS	39209
Furman, Jr.	Ralph	9216 Hensarling Rd.	Petal	MS	39465
Galey	C.D	P. O.Drawer 791	Hattiesburg	MS	39403
Gandy, Jr.	Mrs J. M.	19 Marlin Circle	Hattiesburg	MS	39402
Gannon	C.	1344 Wooddell Dr.	Jackson	MS	39212
Gardner	Louise and Dan	190 Bluebird Lane	Brandon	MS	39042
Garrott	Anne	1807 Ray Street	Ocean Springs	MS	39564
Gibbs	Pat & Terry	1067 3rd Ave.	Laurel	MS	39440
Gillespie	Sarah	500 Walnut	Hattiesburg	MS	39401
Gillie	Nathan and Marie	2754 Hwy 29	Brooklyn	MS	39425
Gillie	Doris	233 St. John Road	Brooklyn	MS	39425
Gillie	Kim	228 St. John Road	Brooklyn	MS	39425
Gilpin	Michael	517 Eatonvile Rd.	Hattiesburg	MS	39403
Gorsey	John	502 Martin Avenue	Ocean Springs	MS	39564
Gosselink, Prof. Emeritus	James	LSU, Dept. of Ocean & Coastal Science	Baton Rouge	LA	70803
Graham	William	P.O. Drawer 750	Hattiesburg	MS	39401
Graves	Carolyn	P. O. Box 154	Moselle	MS	39459
Graves	Olivia and John	21568 Gartman Road	Saucier	MS	39574
Gray	John K.	506 Rebecca Ave.	Hattiesburg	MS	39401
Gunn	Annie	5025 Wayneland Drive	Jackson	MS	39211
Guthrie	John G.	P.O. Box 400	Wiggins	MS	39577
Hall	SFC Jeanette S.	1127 Eatonville Rd.	Hattiesburg	MS	39401
Hall	Robert	224 Mitchell Street	Ocean Springs	MS	39564
Hammack	Marcus	14900 Highway 22	Bolton	MS	39041
Harper	William & Martha	129 St. Charles	Biloxi	MS	39530
Hatten	Budge	Box 98	Wiggins	MS	39577
Havens	Peter	3505 Anderson Hill Road	Silverdale	WA	98383
Heath, Forester	Jim	101 Jami Street	Jackson	AL	36545
Heidelberg, Jr.	Mrs. R.W.	801 S. 18th Ave.	Hattiesburg	MS	39401
Hembree	Dan G.	807 Progress Road	McLain	MS	39456
Hensen	Dan	15031 Bethel Hill Road	Ocean Springs	MS	39564
Herrington	Terry	Box 1973	Hattiesburg	MS	39403
Hicks	Mr. G.S.	8 Dogwood Hill Drive	Jackson	MS	39211
Hill	Merrianne	5261 Clair Street	Jackson	MS	39206
Hilliard, Director	Elbert	MS Dept of Arch. & Hist. Box 571	Jackson	MS	39205
Hilton	Jean	9406 Janice Brooklyn Rd.	Brooklyn	MS	39425
Hinkle	Sharon	41 40th Street	Gulfport	MS	39507
Hirsch	Peter J. and Joan	13128 Hanover Drive	Ocean Springs	MS	39564
Holladay	Robert Lawson	P.O. Box 288	Drew	MS	38737
Hoper	Robert	1210 35th Street	Gulfport	MS	39501
Houston	Joe	Route 2 Box 179	Raleigh	MS	39153
Howell	William S.	P.O. Box 667	Purvis	MS	39475
Hudson	Robert V.	483 Elks Lakes Rd.	Hattiesburg	MS	39401
Huffman	Alan	1056 Old Bridgeport Road	Bolton	MS	39041
Hughes	Jess	P.O. Box 763	Hattiesburg	MS	39403
Hughes, Jr.	Dan C.	P. O. Box 5628	Brandon	MS	39047

Distribution List For Summary of Final EIS

Humphrey	Henry S.	15805 Allie Byrd Road	Ocean Springs	MS	39564
Hyde	Rosemary	322 Owen Drive	Grenada	MS	38901
Jarrell	Robert	328 Emerson Drive	Hattiesburg	MS	39401
Johnson	Robert L.	189 Arnett Road	Hattiesburg	MS	39401
Johnson	Lawrence E.	608 Concart Street	Hattiesburg	MS	39401
Johnson	Charles	P. O. Box 16358	Hattiesburg	MS	39404
Johnson	Don	14 Williamsburg Dr.	Petal	MS	39465
Johnson	Exton R.	15324 Royal St.	Gulfport	MS	39503
Johnson	Robert	23230 Saucier-Lizana Road	Saucier	MS	39574
Jones	Roger	P. O. Box 1028	Jackson	MS	39215
Jordan, Chief	Freddie	301 Bldg, Suite 300	Jackson	MS	39201
Kallam	Stewart	77 Lee Cemetery Road	Tylertown	MS	39667
Keenan	C. T. and Jeannette	1203-E Old Pass Road	Long Beach	MS	39560
Keith	Susan	519 Greensboro Street	Starkville	MS	39759
Keppner	Dr. Edwin	3500 Delwood Beach Road	Panama City	FL	32407
King	Honorable Tom	P. O. Box 1134	Petal	MS	39465
Kochtitzky	Penny	273 Ralph Rawls Rd.	Hattiesburg	MS	39402
Koopman	Frank and Florence	108 Ramoneda Street	Bay St. Louis	MS	39520
Kornman	Pam	3076 Highland Avenue	D'Iberville	MS	39532
Kulick	Patricia	13713 Windlo Circle	Ocean Springs	MS	39564
Kutack, Business Manager	Jason	P. O. Box 16357	Hattiesburg	MS	39404
Laird	Carrie	245 E. Capitol Street, Rm.226	Jackson	MS	39201
Langenwalter	W. D.	52 - 54th Street	Gulfport	MS	39507
Lantz	Allen D.	104 St. Augustine Dr.	Long Beach	MS	39560
Lebow	Jeanne	P. O. Box 290	Gautier	MS	39553
Lee	Justin	590 Leeville Road	Petal	MS	39465
Lee	Robert E.	2039 North Drive	Biloxi	MS	39531
Lewis	J. Tipton	P.O. Box 627	Jackson	MS	39205
Lewis	Leighton	P.O. Box 1231	Hattiesburg	MS	39403
Lindsley, Jr.	William R.	6142 Old Hwy 42	Hattiesburg	MS	39402
Loper	Gary	2613 Bullis Avenue	Gulfport	MS	39501
Lott	Honorable Trent	SR-487 Russell Senate Office Bldg.	Washington	D.C.	20510
Love	Louise	306 Grand Avenue	Yazoo City	MS	39194
Lowrie	Allen	230 FZ Goss Road	Picayune	MS	39466
Luck, III	Leon E.	213 Dewey Ave.	Ocean Springs	MS	39564
Mabry	John	Mabry Lumber Company	Liberty	MS	39645
Mahaffey	Faye	Rt 3, Box 30, Mullican Rd	Florence	MS	39073
Maslowski	Mrs. Edward	30-51 Street	Gulfport	MS	39507
Mason	Robert D. and Betty	P.O. Box 61	Brooklyn	MS	39425
Masters	David and Carolyn	76 Shady Lane	Hattiesburg	MS	39402
Mauffray, Jr.	Owen L.	22 Magnolia Trace	Hattiesburg	MS	39402
Maxim, Jr.	Mrs. G.F.	13 Maxim Dr.	New Augusta	MS	39462
McArthur	N.	1000 Beverly Hills Rd.	Hattiesburg	MS	39401
McArthur	Johnny	P.O. Box 5	Hattiesburg	MS	39403
McClendon	Arvah	5107 Quincy Avenue	Gulfport	MS	39507
McConnell, SE Rep	Chester A.	110 Wildwoods Lane	Lawrenceburg	TN	38464
McDaniel	Ms. Sandra	1451 Rebel Drive	Jackson	MS	39211
McDaniel	Mrs. Pat	2308 Middlecoff Drive	Gulfport	MS	39507
McDannald	B. Randolph	209 Tantallon Drive	Ocean Springs	MS	39564
McGinnis	Helen	103 Magnolia Street	Edwards	MS	39066
McGinnis	L. A. and Lucy	2303 McInnis Street	Hattiesburg	MS	39402
McGuire	J.D.	30 52nd Street	Gulfport	MS	39507
McIlwain	Tom	P.O. Box 7000	Ocean Springs	MS	39564
McIntosh	Mark F.	910 Fairview Street	Jackson	MS	39202
McKell, Jr.	William M.	4105 Hospital St., #111	Pascagoula	MS	39581
McLeod	Sara	621 Eagle Avenue	Jackson	MS	39206
McPherson	Randall	Rt. 2 Box 1266	Starkville	MS	39759
McSwain, Sr.	Robert J.	P.O. Box 401	New Augusta	MS	39462
Miller	David	1908 Swallow Lane	Tupelo	MS	38801
Miller, Professor	W. Frank	P.O. Box 9681	Mississippi State	MS	39762
Mitchell, Chief-Coastal Prog.	Jerry	2620 Beach Boulevard	Biloxi	MS	39531
Mixon, Jr.	Mrs. G.F.	13 Mixon Drive	New Augusta	MS	39462
Montgomery	Honorable G.V.	2184 Rayburn House Office Building	Washington	D.C.	20515
Moon	Michael	1002 Terminal Drive	Moselle	MS	39459
Morrison	Claire	4 Boggsdale	Long Beach	MS	39560
Murdock	Michael	Rt. 2 Box 249	Moselle	MS	39459
Musgrave	Anna	Rt. 1., Box 824	Hattiesburg	MS	39401
Myers	Robert T.	P.O. Box 1464	Hattiesburg	MS	39403
Myers	Donnie F.	373 Sheeplo Loop	Petal	MS	39465
Napier	Wenda G.	404 South Main Street	Petal	MS	39465
Napier	J.E. and Reba	P. O. Box 135	Petal	MS	39465
Napier	R.M.	Rt. 2 Box 50	Seminary	MS	39479
Nye	Eric	73711 Diamondhead Dr. N.	Diamondhead	MS	39523
Odom	Mrs. Doug	839 Arlington Street	Jackson	MS	39202
Odom	Michele & Terry	129 Fillingame Road	Hattiesburg	MS	39401
Odom	Stewart	810 31st Avenue	Hattiesburg	MS	39401
Oglesbee	Debra	180 John Bond Road	Wiggins	MS	39577
Owens	J.R.	201 Pecan Grove Dr.	Hattiesburg	MS	39402
Pace	Louis and Shirley	116 Lamar Avenue	Hattiesburg	MS	39402
Page	Mary	133 Caribbean Cove	Clinton	MS	39056
Parker	Honorable Mike	1410 Longworth House Office Building	Washington	D.C.	20515
Parker	Freeman	106 Wildwood Trace	Hattiesburg	MS	39402
Patterson	Tammy	27 Brewer Rd.	Purvis	MS	39475
Patterson, Jr.	Vernon R.	P. O. Box 704	Beaumont	MS	39423
Paulson	Oscar	1550 2nd Street #57	Pass Christian	MS	39571
Pearce	Lois Anne	330 Lakebend Drive	Brandon	MS	39042
Pearce	Mrs. Eula B.	32 Paret Tower Road	Brooklyn	MS	39425
Pearce	Gordon E. and Violet	62 Paret Tower Rd.	Brooklyn	MS	39425
Pearson	Doris	150 W. Main Street	Florence	MS	39073
Perrot	Mrs T.W.	P. O. Box 16894	Hattiesburg	MS	39404
Phalen	Tim	615 S. 19th Ave.	Hattiesburg	MS	39401
Pickering	John D.	11 Clinic Road	Hattiesburg	MS	39402
Pickering	Larry	572 Big Four Road	Wiggins	MS	39577
Pillow	Hart	110 Sis Circle	Hattiesburg	MS	39402
Polk	Frank	PO Box 1150	Hattiesburg	MS	39401
Pool	Joann W.	121 Woodglen Drive	Gulfport	MS	39507
Potvin	Leo	683 Lynn Ray Road	Petal	MS	39465
Price	Thomas and Jeanette	410 Weathersby Road	Hattiesburg	MS	39402
Puckett	Jim	P. O. Box 16863	Hattiesburg	MS	39404
Purvis	Dale	P.O. Box 4079	Gulfport	MS	39502
Raley	Charles	P. O. Box 298	Gautier	MS	39553

Distribution List For Summary of Final EIS

Rawlings, MD	Franklin	1155 Ocean Springs Road	Ocean Springs	MS	39564
Rawls	C.E.	11438 Coleman Rd.	Gulfport	MS	39503
Rawls	Don	4110 Washington Avenue	Gulfport	MS	39507
Ray	William K.	Box 16509	Hattiesburg	MS	39403
Recore	Lauril	327 Barkwood Circle	Biloxi	MS	39532
Reese	Elizabeth S	406 Jeff Davis Avenue	Waveland	MS	39576
Reid, Dist. Engineer	William	P.O. Box 1509	Hattiesburg	MS	39403
Rhodes	Margaret	P. O. Box 178	Ackerman,	MS	39735
Rich	Troy W.	13611 Three Rivers Road	Gulfport	MS	39503
Richard	Bryan J.	14535 Big John Road	Biloxi	MS	39532
Richter	Susan T.	4839 Sheridan Dr.	Jackson	MS	39206
Ricks	William K & Camelia B	6512 Shore Drive	Ocean Springs	MS	39564
Robiller	J.E.H.	402 Fleitas Avenue	Pass Christian	MS	39571
Robinson	A.A.	P.O. Box 16507	Jackson	MS	39236
Rowe	Sarah	111 N 33rd Ave., #E-11	Hattiesburg	MS	39401
Shaffer	Dorothy	317 Westview Drive	Biloxi	MS	39531
Shank	Brett	20553 Hilltop Rd	Saucier	MS	39574
Sharp	James and Jane P.	903 Farnsworth Avenue	Pascagoula	MS	39567
Shelby	Les	126 Fannin Landing Road	Brandon	MS	39042
Shepard	Steve	P.O. Box 514	Gautier	MS	39553
Simmons	Frances	6518 U.S. Hwy 49	Hattiesburg	MS	39401
Simonton	J.B.	230 Briar Hill Cove	Florence	MS	39073
Simpson	Willie and Joe	8 Fathom Circle	Hattiesburg	MS	39402
Sisk	Larry W.	17 Ruth Ezell Rd.	Hattiesburg	MS	39401
Skupien, Comm. Coordinator	Linda C.	P. O. Box 7000	Ocean Springs	MS	39566
Slade	Susan	P.O. Box 143	Purvis	MS	39475
Slater	E.L. and Margaret	9210 Scenic River Drive	Biloxi	MS	39532
Sledge	T. Mark	P. O. Box 1021	Jackson	MS	39215
Smee	Nola	15708 Little Joe Road	Biloxi	MS	39532
Smith	Mrs Frances Price	401 S. 21st Ave	Hattiesburg	MS	39401
Smith	Quilla	Route 6, Box 1499	Hattiesburg	MS	39401
Smith	Benita	1610 Glenn Swetman	Biloxi	MS	39530
Smith	Bob	Post Office Box 117	Biloxi	MS	39533
Sneed	Robert W.	P. O. Box 2251	Jackson	MS	39225
Snell	Lydia	2618 Demaret Drive	Gulfport	MS	39507
Spann	C. W.	545 16th Street Apt. #36	Gulfport	MS	39507
Speed	Charles	341 Ralph Rawls Rd.	Hattiesburg	MS	39402
Spell	Joe	1905 Ridgeway	Hattiesburg	MS	39401
Spinks	Joe	Louisiana-Pacific	Philadelphia	MS	39350
Stachling	M. David	P. O. Box 508	Biloxi	MS	39533
Steed	Allen T.	588 Leeville Rd.	Petal	MS	39465
Stevens	W. Kenneth	P.O. Box 151	Hattiesburg	MS	39403
Stocker	Lisa	International Paper Company P.O. Box 412	Canton	MS	39046
Stocker, Chairperson	Lisa	P.O. Box 412	Canton	MS	39046
Stone	Richard	1216 Marie St.	Hattiesburg	MS	39402
Streuly	Charles D.	2605 Demaret Drive	Gulfport	MS	39507
Sullivan	Mr. Garland W.	209 N. 22nd Ave.	Hattiesburg	MS	39401
Tatum	Joe F. and J. F.	2600 Mimosa Ln	Hattiesburg	MS	39401
Tatum, Jr.	Frank	112 Mandalay Dr.	Hattiesburg	MS	39402
Tatum, Jr.	John M.	P.O. Box 1649	Hattiesburg	MS	39403
Taylor	Honorable Gene	215 Cannon House Office Building	Washington	D.C.	20515
Taylor	Patricia	11099 Woolmarket Lk. Rd.	Biloxi	MS	39532
Temple, Proc Mgr.	F. Lee	Rt 1, Box 17	Duck Hill	MS	38925
Thomas	Mark W.	728 Berkshire Dr.	Hattiesburg	MS	39402
Thompson	Honorable Bennie G.	1408 Longworth House Office Building	Washington	D.C.	20515
Thompson	Henry E.	2314 N. 5th Ave.	Laurel	MS	39440
Tims	James	P. O. Box 2111	Laurel	MS	39440
Tisack	Sam and Elaine	799 Mars Hill Road	Wiggins	MS	39577
Todd	Sally	2228 Wild Valley	Jackson	MS	39211
Touchstone	Gene	148 Ace Carlisle Rd.	Richton	MS	39476
Travgott, Chair, MS SAF	Tim	1241 Mound Street	Grenada	MS	38901
Troyka	Robbie and Jeff	37 Ferwood Dr.	Laurel	MS	39440
Tuepken	Jo	#3 Boggs Drive	Long Beach	MS	39560
Tynes	Inez	R.R. 1 Box 151	Magee	MS	39111
Valerine	Mrs. V.H.	19447 Shorecrest Road	Biloxi	MS	39532
Van Zandt	Woodie	18227 Smith Road	Gulfport	MS	39503
Van Zandt	Edward	6194 W. Wittman Road	Pass Christian	MS	39571
Vance	Colonel Hilton R.	5912 Kristen Drive	Jackson	MS	39211
Varnado	David	315 West Street South	McComb	MS	39648
Varnado, Jr.	T. D.	2004 East Pass Road	Gulfport	MS	39507
Venus, Jr.	Rev. Charles C.	900 Dabbs Street	Hattiesburg	MS	39401
von Seutter	Virginia	P. O. Box 104	Magee	MS	39111
Waldorf	David and Elizabeth	2611 Parkview Drive	Biloxi	MS	39531
Walker	Mr. Roger G.	P.O. Box 571	Jackson	MS	39205
Walker	Emmett	1055 Newland St.	Jackson	MS	39211
Walley	Paul G. and Marie	Route 4 Box 105AA	Richton	MS	39476
Walters	Gary	2054 Hwy 29	Brooklyn	MS	39425
Walters	Gene	#1 Ponderosa Dr.	Petal	MS	39465
Watson	Dr. Ray	Dept of Biol. Science Drawer GY	Mississippi State	MS	39762
Weems	Stephen L.	Rt. 2 Box 14BB	Lake	MS	39092
Weldy	Larry and Debbie	800 Carterville Road	Petal	MS	39465
Wells, Jr.	W.E.	GA-Pacific Corp, Ste 104B 1080 River Oaks	Jackson	MS	39208
Whatley	David B.	165 Whatley Road	Brooklyn	MS	39425
White	Patricia	Route 2, Box 387	Heidelberg	MS	39439
White	Edith	124 Clower Ave	Long Beach	MS	39560
White	C. Thomas	2313 Ellis Merchant Road	Pascagoula	MS	39567
Whitten	Honorable Jamie L.	2314 Rayburn House Office Building	Washington	D.C.	20515
Wilkinson	Rodney and Karen M.	11553 Harris Drive	Gulfport	MS	39503
Williams	Donald F.	9383 Janice Brooklyn Rd.	Brooklyn	MS	39425
Williams	Cecil	1105 Park Drive	Laurel	MS	39440
Williamson	G.D.	1216 Elks Lake Rd.	Hattiesburg	MS	39401
Williamson	David and Brenda	P. O. Box 614	Hattiesburg	MS	39403
Winn	Cecil L.	107 Chesterfield	Hattiesburg	MS	39402
Wolfe	Douglas and Elizabeth	18 Acorn Place	Hattiesburg	MS	39402
Wood, Jr., Chair	Forrest	SS, Box 5015	Hattiesburg	MS	39406
Woodall	Donald	P. O. Box 15853	Hattiesburg	MS	39402
Woodbridge, Jr.	Dr and Mrs H.B	327 Briarwood Drive	Jackson	MS	39206
Wray	Lamar	Rt. 1 Box 13	Kilmichael	MS	39747
Young	Paul and Celeste	112 Elias Whiddon Rd.	Hattiesburg	MS	39401
Zander	Carlton	27440 Wolf Creek Road	Perkinston	MS	39573

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